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Index to Advertisers—Page xl.

Principal Contents:

	PAGE
A Specialised Oil Refinery	159
Too Many Technical Terms. By C. R. Cosens	161
Rupturing Capacity. By W. G. Briggs	162
Power in a Tea Factory. By H. Crownshaw	163
Testing Prepayment Meters. By J. Bailey	164
Loughborough College Power Station	165
Birmingham Telephone Headquarters	166
Coronation Illuminations	167
Electrical Contacts. By Edmund Downs	168
Meetings and Discussions	171
Correspondence: Electrical Engineers' Remuneration; The Future of the Tramways; A Salesman's Grievance	172
New Apparatus and Devices	173
Fractional Horse-power Motors	174
The Electrical Situation in Australia	175
Maintenance Work. By "Works Engineer"	176
The Contractors' Dinner	177
Business and Industrial Notes	178
Electricity Supply	182
Communications	184
Contract Information	185
Our Personal Column	187
Financial Section	188
Published Specifications	191
New Work for Contractors	192

Sales and Service Training

SALESMANSHIP and service are two of the matters that do not become less important as time passes and the expansion of electricity supply continues.

Gratified as we may be with the increased consumption as revealed by official statistics, a large percentage of the population of Britain are either not consumers of electricity for any purpose at all or they employ it to an almost ludicrously limited extent. This calls for better training of, and more intensive canvassing and salesmanship by, men and women qualified to look at matters from the potential consumer's standpoint.

The greater need for prompt and efficient service is a natural consequence of the increasing number of consumers and the new kinds of service that they require as they increase their electrical operations in different parts of the household or the factory.

Both of these essentials—salesmanship and service—have been stressed for so many years that those who are not in possession of an inside knowledge of the position might well believe that an apology ought to be offered for urging their importance in the year 1937. The need for something more to be done is, however, constantly in evidence.

We do not for one moment suggest that nothing at all has been done to alter things during the past five or ten years; that would be entirely contrary to the facts, for many electricity supply undertakings have enterprise to their credit as the outcome of counsel published in pages of the ELECTRICAL REVIEW, discussions before various organisations, and recommendations from official quarters. What we do say is that what has been, and is being, done is quite inadequate when considered beside the opportunity and the necessities of the situation.

No doubt uncertainty with regard to the effect of proposals that have been advanced by official committees has acted as a restraint upon some authorities who might have been more enterprising had there been a more settled outlook, while it has probably led to an acceleration of the business-getting pace where the chances are in favour of exceeding a specified output figure.

All these considerations have a bearing upon a new scheme which is this week announced by the British Electrical Development Association, and is summarised on page 176, for providing a six-months' correspondence course of training in salesmanship for men and women engaged in electricity supply work or employed in other branches of the electrical industry.

The course is one which should stimulate the imagination of those who take it, and the certificates which it is proposed to award to those who satisfy certain tests will afford some indication of their capabilities. They will not, however, be acceptable as evidence of their possessors' right to be regarded as complete and efficient salesmen and saleswomen.

The purely "paper" training and tests must be reinforced by something more practical. It is in this direction that the proposed discussion groups will be useful. These will give an opportunity to the real salesmen to prove themselves capable of handling other people and of relating the more or less hypothetical methods of the course to the everyday problems encountered in business.

Later it is hoped to institute diplomas, which will be awarded for practical as well as theoretical qualifications, and these should carry some weight in raising the salaries of really competent men and women to the higher levels which the importance of their job merits.

The E.P.E.A. Scheme

WHEN dealing with the new E.D.A. salesmanship course, it is due to the Electrical Power Engineers' Association to remember that that body is doing something in this direction. The inevitable reduction in generating-station staffs has brought with it the necessity for displaced men to equip themselves for the distribution and sales side. The correspondence courses instituted by the E.P.E.A.

are mainly strictly technical ones, but there is also a course for sales and consumers' engineers. This has much in common with the E.D.A. plan, although, being for men who already possess technical knowledge, it is on a somewhat higher plane. It is designed to cover the application of this technical knowledge to the consumer's problems, but it also includes the "theory, practice and technique of salesmanship" as well as publicity.

The Eleventh Edition

A PERIOD of over seven years elapsed between the publication of the ninth and tenth editions of the I.E.E. Wiring Regulations. The last edition appeared in September, 1934, but already the appearance of the eleventh edition is imminent; it is expected to be ready in the early summer. This, we must believe, is principally due to the increased interest taken by the industry in the Regulations and by their wider adoption as a standard of good wiring practice by public authorities, architects, builders and individual customers, which has brought a need for simplification and modification in a number of respects. No doubt in revising the Regulations the Wiring Rules Committee has paid due regard to the criticisms and suggestions which arose from the tenth edition. Our readers will recall, for instance, the series of articles in our pages in which Mr. H. R. Taunton examined the new Regulations very thoroughly and made many constructive proposals for their clarification and improvement. The "Employees' Guide" to the Regulations prepared by the Association of Supervising Electrical Engineers is now out of print, but in view of the approaching new edition the Association has decided not to reprint it. We hope, however, that a revised guide will follow on the heels of the eleventh edition.

Remote Sub-stations

AT the inquest on a sub-station attendant who died as a result of burns received from the explosion of an 11-kV switch at Dudley, the jury expressed the opinion that there should be at least two men on night shift. This does not go to the root of the trouble, and there appears to be nothing to show that the presence of an additional man would have prevented the accident. More to the point would have been a suggestion regarding remote operation of circuit-breakers in such circumstances. It does not add to the confidence of switchmen when it is stated, as in the present instance, that the switch which failed when closed on a short-circuit 700 yards away was regarded as adequate.

"Memorial" Units

IT sometimes seems as though electrical physicists have gone out of their way to find some quantity, measurement or conception to which they could apply the name of a great scientist as a recognition of their indebtedness to him. Many of these, sometimes clumsily named, units have caught on, but others have currency only in the most exclusive circles. How many of our readers could define, without some hesitation, the "weber" or even its fundamental, the "maxwell"? Amperes they know, and volts and ohms, but what is an "oersted"? As Mr. C. R. Cosens points out in his article on page 161, mechanical and hydraulic engineers do not hesitate to employ compound terms to define their quantities. Why, then, should electrical engineers (or, at any rate, electrical scientists) introduce new terms to perpetuate the memory of pioneers? It is doubtful, anyhow, whether their pious hope is fulfilled. Who thinks of Volta nowadays when speaking of volts?

Loughborough College

THE improvisation of a generating station at Loughborough College from war material provided the students of a dozen years ago with plenty of opportunities to show their aptitude for dealing with practical problems of a type that they were quite likely to encounter in later life. The new generating station should give them experience that is equally valuable, if in a different way. It is operated on the lines followed in modern stations with the usual log entries, and the thermal efficiency is worked out each day. Maintenance work is done in the repair shop, and there is a regular routine with regard to engine adjustments, thus providing a connecting link between purely electrical matters and their associated mechanical engineering aspects. Apart from the educational value of the plant, it is claimed that a saving of over £3,000 per annum (after allowing for capital charges) is likely to be effected by the adoption of independent generation. On a consumption of less than 500,000 kWh per annum, that would surely argue an extraordinarily high quotation for public supply.

The Part and the Whole

ACCORDING to a statement attributed to Dr. Krecke, director of the Electric Group of Industries in Germany, the consumption of electricity in that country is at present about 60 per cent. above that of 1932 and 10 per cent. above the highest previously obtained. He announced that the Government had no intention of competing with supply undertakings and proposed to limit its actions to indicating the general lines that the supply industry should follow and to completing as soon as possible a high-voltage interconnecting system to feed any part of the country in emergency. This viewpoint would appear to be very much the same as that obtaining generally in Great Britain, *i.e.*, that electricity supply is best left to work out its own salvation under a planned policy—co-ordination supplemented by local initiative.

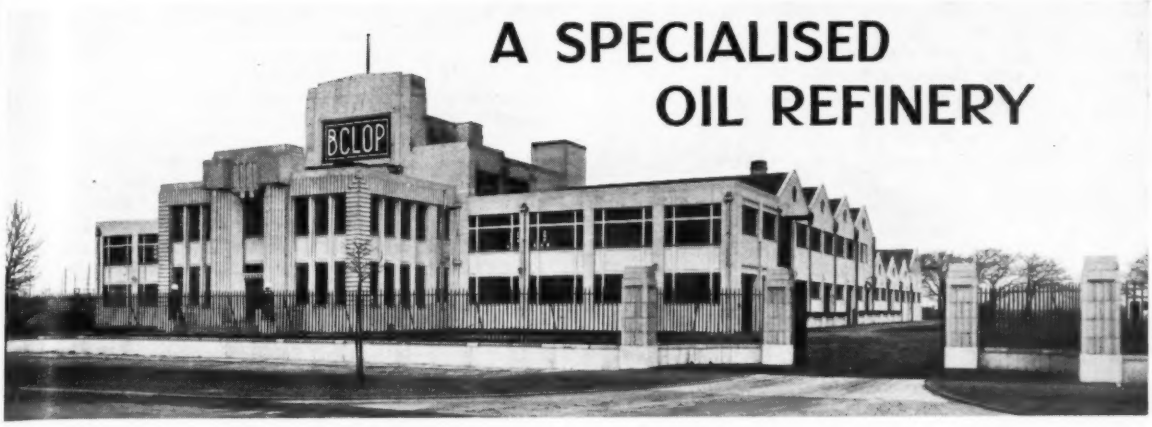
An Ambitious Scheme

As he confessed, Mr. H. M. Drake, the President of the E.C.A., put forward at last Tuesday's dinner a scheme for the regularisation of the supply and contracting branches of the industry which would have formed the basis for a presidential address. As will be gathered from the summary which we publish on page 177, the plan is a drastic one, although the speaker maintained that it was not revolutionary, having been already successful on a smaller scale. The proposals must remain for further examination, but one possible outcome would be compulsory registration. Mr. H. T. Young, President I.E.E., thought that this was hardly possible yet in this country, and hinted that its success elsewhere had not been altogether certain. He suggested that much remained to be done in the way of voluntary registration. On the other hand, Sir Felix Pole urged the contractors to ask for a charter as a means of ensuring sound installation work.

Shut-Downs

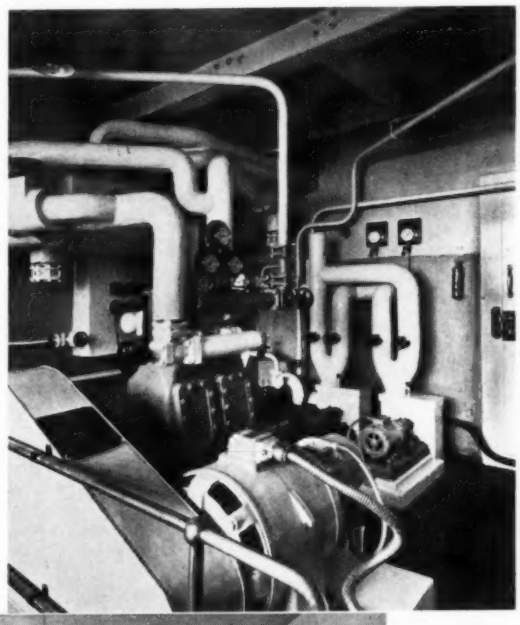
WHILE the stormy weather round about last week-end was responsible for a certain amount of dislocation of electricity supply in some of the more exposed parts of the country, no trouble has occurred here in any way comparable with that experienced at Hamburg. There, according to *Reuter*, the gale caused a fall in the level of the River Elbe on Monday night which was enough to drain the canal serving the generating station. On the following day the town was still deprived of electricity and the telephones were also affected, and the report states that the engineers were awaiting high tide to fill special reservoirs. Failures of supply due to freaks of Nature are more difficult to guard against than are those of electrical origin, even when the latter occur at a main distribution point. Thus the interruption of the service from Barking, due to a small fire at 11 p.m. on Tuesday last, although it affected a wide area south of the Thames, was put right within from five to twenty minutes, and, owing to the lateness of the hour, caused relatively little inconvenience to the public. While it is unfortunate that the organisation for restoring supplies should have been called upon to demonstrate its effectiveness in this way, it may well provide an example of how similar troubles, if and when they do occur elsewhere, may be minimised.

A SPECIALISED OIL REFINERY



STIRRING and pumping large quantities of fluid, and refrigeration represent the principal applications of electricity to the production of medicinal cod liver oil, at least as we saw it recently at the new refinery at Marfleet, Hull, of British Cod Liver Oil Producers (Hull), Ltd. This refinery is believed to be the largest of its kind in the world, and it represents the establishment of practically a new industry in this country. Crude oil is the raw material of the new factory, for the actual extraction of the oil from the cods' livers is carried out on the fishing trawlers at sea. Practically all the trawlers operating from Hull are suitably equipped with boilers for the extraction of the oil, and with suitable tanks for the storage of the crude oil pending its arrival at Hull.

It is conveyed to the refinery in tank wagons from which it is pumped to large storage tanks at the rate of from 500 to 700 gal. per hour by a directly coupled 5-h.p. motor-driven centrifugal pump. From these storage tanks the crude fluid flows under gravity into centrifugal separators in which the containing bowl revolves at 6,000 r.p.m.



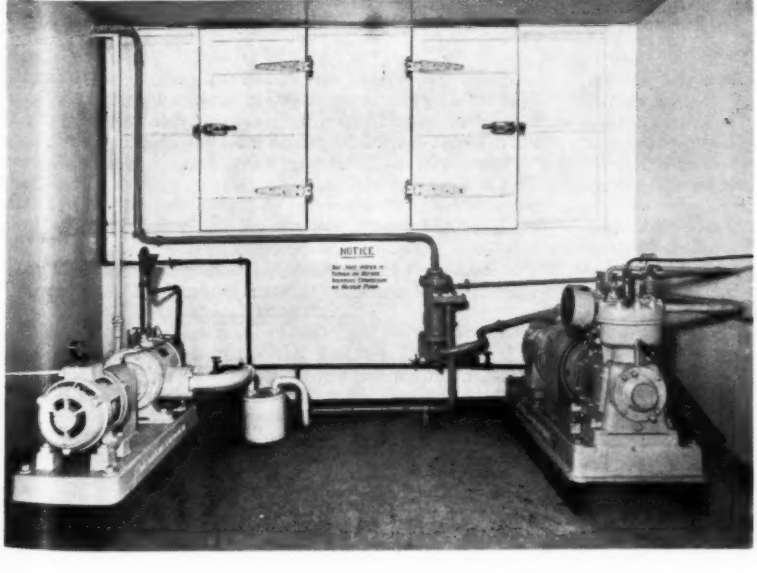
The ammonia compressor set and brine and cooling water circulating pumps

The incorporated 3-h.p. 1,460-r.p.m. motors belt drive on to the speed-increasing gears within the centrifuges.

Water, clear oil and solids are all separated by centrifugal force, the water and oil being passed off simultaneously, but separately, from the machines, while the solids are retained in the bowl. Purifying and clarifying are two stages of the separating processes, but the machines are identical in design and actual operation. Each centrifuge houses also a small circulating pump driven by the same motor, and by this means the oil is conveyed to storage tanks, holding about 60 tons of oil each.

Blending is the next process, and judging from what we saw we should say that it is perhaps the producer's most important process. Electrically, however, the significance of blending is the constant stirring required. The oils are mixed in a well below floor level, and a 5-h.p. vertical motor above the floor drives a stirring paddle in the well. A battery of three 2-h.p. motor-driven pumps, each serving its own distinctive pipe line, forms an essential part of the blending installation, and the pumps remove the blended oil to storage tanks in a bleaching room. Under gravity the oil flows from these tanks into clarifying pans, and here again stirring affords another electrical application. A 2-h.p. motor on each pan drives the stirrer through bevelled gears, and after being passed through pressure filters by a reciprocating pump belt driven by a 2-h.p. motor, *via* a counter shaft, the oil from the collecting trough at the side of the filter is pumped to storage tanks by a 1-h.p. motor.

Cooling is the next process of importance, and while electricity again provides an important service by constant stirring of the oil in the cooling tanks. Another vital application is the driving of the ammonia compressor which serves the brine cooling equipment and evaporator in the room in which the cooling tanks are situated. The paddle of each cooler revolves at 4¼ r.p.m. and it is driven through a double reduction gear by a 5-h.p. motor, the motor and the reducing gear being built up as one equipment with a common housing. The compressor is housed in a room adjacent to the cold room, together with two brine and one cooling-water circulating pumps, each driven by a 2-h.p. motor. The No. 4



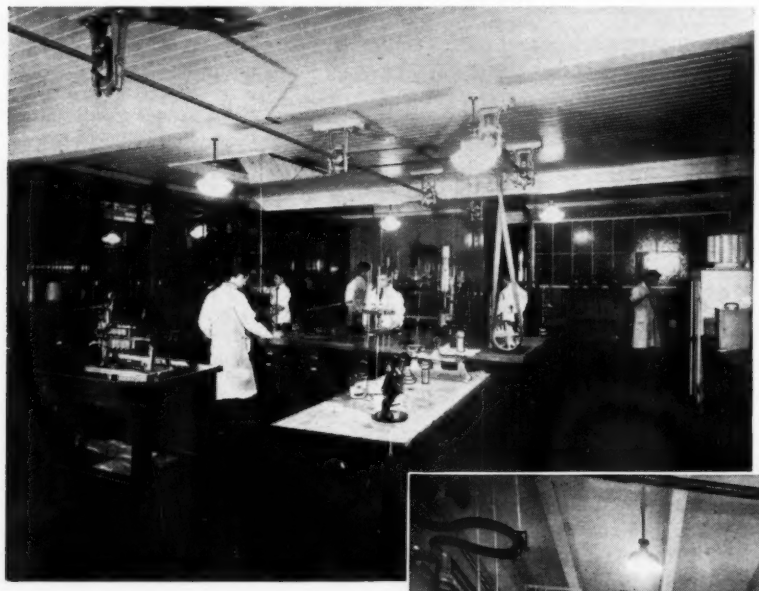
Vertical compressor and vacuum pump equipments serving the rotary filters

"A.S.S." sleeve-valve NH_3 compressor was supplied by the Liverpool Refrigeration Co., Ltd., and is driven by a 22-h.p. motor *via* multiple V belts.

Filtering for the removal of stearine (fats solidified by the low temperature) is next carried out in either pressure-type or rotary filters operated from a line shaft. Six filter presses provide an interesting group drive for a 7.5-h.p. motor, and each

press is equipped with its own reciprocating pump. The rotary filters are served electrically in three ways. The drum of each is driven by a 2-h.p. geared motor which provides a 44-r.p.m. drive for further transmission by chain on to the worm reducing gear on the bed of the filter. Under the action of air pressure and vacuum clear oil is drawn through the filter cloths on the drum surface on the outside of which the solid fat stearine residue is left. Motors of 15-h.p., 720-r.p.m. and 10-h.p. 1,440-r.p.m. respectively, drive a compressor and a vacuum pump and these serve the rotary filters as indicated.

Before the final removal of the completely refined product to the glass-lined storage tanks in which it awaits dispatch there is one more process, by steam treatment, for which, again, pumping and stirring are electrical applications similar to those already described. Large quantities of water are required for the washing plant and for the refrigerating equipment, and are provided by a pumping installation housed separately from the main building and comprising two 10-h.p. motor-driven pumps with their controls so arranged with a change-over switch that only one motor can be on circuit at a time.



The separating room

The motors are automatically float-switch controlled from equipment in the storage tank which they serve.

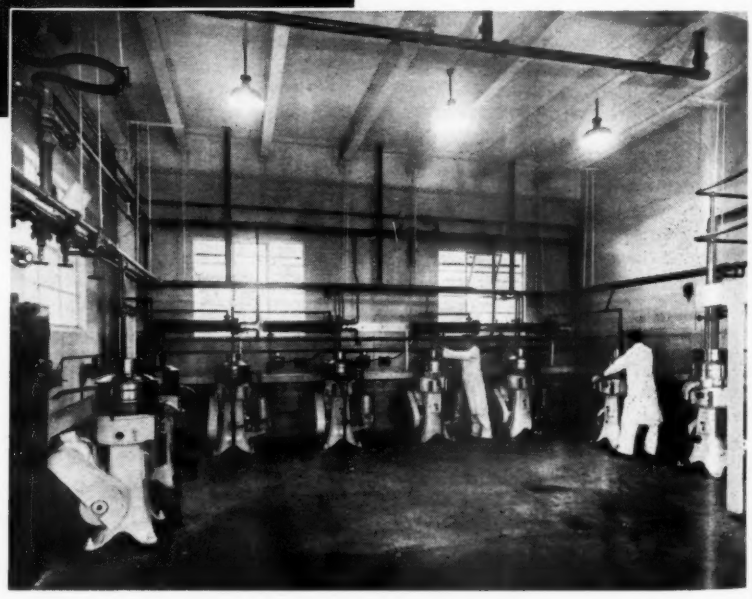
Except for the slip-ring unit driving the refrigerator compressor, all the motors are s.c. units and are controlled by Allen West direct-on-line automatic starters with push-button operation and overload and no-volt protection. The slip-ring motor is controlled by an A.W. primary oil circuit-breaker and a rotor resistance starter with protective gear. All the controlling equipment for the motors in the cold room is housed at one point outside the room because of the damp atmosphere, but generally the starting equipments are situated conveniently near their motors. Throughout the installation we saw motors of Metropolitan Vickers, Fuller and G.E.C. manufacture.

While the foregoing completes a brief outline of the actual refinery processes, much work of a highly specialised nature calculated to ensure the high quality of the product is carried out in separate biological research laboratories. Here we saw a good deal of electrical equipment employed for the scientific breeding and rearing of tame rats and chickens, and for scientific investigations on the feeding of these animals.

X-ray examination of the bones of "tested" animals is permitted by a "Metalix" dental outfit provided by Phillips Industrial. It operates at 55 kV and has a self-protected Coolidge tube. Bedding for the animals is treated in an Aveling-Barford steam steriliser. This has a 9-kW bank of immersion heaters in a water well at the bottom, and the well is automatically filled under ball-valve control. After sterilisation the bedding materials are dried in a cabinet equipped with a 5-kW battery of carborundum-type rod elements in the bottom and a motor fan for air circulation at the top with a specially designed motor to stand up to the temperature conditions. A small motor-driven mill is used for food grinding.

Curfew and Hearson 1,000-egg incubators and also battery brooders with thermostatically controlled tubes at the top of each tier are other important components of the electrical installation, while in a chemical sub-laboratory we saw a small furnace for ashing bones, centrifuges, sand baths and ovens—all electrically operated, of course. The laboratories are warmed throughout by Unity tubular heaters under thermostatic control, while storage water heaters of the same make are situated at various convenient points.

Electrical energy is received from the Hull Corporation Electricity Department at 6,600 V and reduced on site to the utilisation pressures of 400 V and 230 V. For power distribution there is a Ferguson Pailin switchboard equipped with mining-type oil circuit-breakers, while main distribution of the lighting supply is effected by an equipment with three 60-A outgoing G.E.C. switch-fuses.



The electrically equipped laboratory

On each floor there is an ironclad power sub-distribution board as well as a number of 10-way 10-A ironclad H.O. pattern lighting distribution boards so disposed and loaded as to balance the total lighting load over the supply phases.

All the main and sub-circuits for both power and lighting in the refinery as a whole consist of Callender cables housed in enamelled (inside) or galvanised (outside) conduit. Crabtree lighting switches and H.O. shockproof lampholders are employed throughout. Above the tanks in the refinery proper watertight prismatic fittings are employed, while at convenient points around the tanks socket outlets are provided for portable inspection lamps.

Messrs. W. L. Harrison, Ltd., and Messrs. Booker and Tarran were responsible for the lighting and power installation work under the supervision of Mr. S. Cooper, then electrical engineer to British Cod Liver Oil Producers (Hull), Ltd., and now manager of the Hull Ice Co., Ltd. We are indebted to the company for permission to visit the refinery and to Mr. Cooper for his assistance in the preparation of these notes.

A French Aluminium Factory

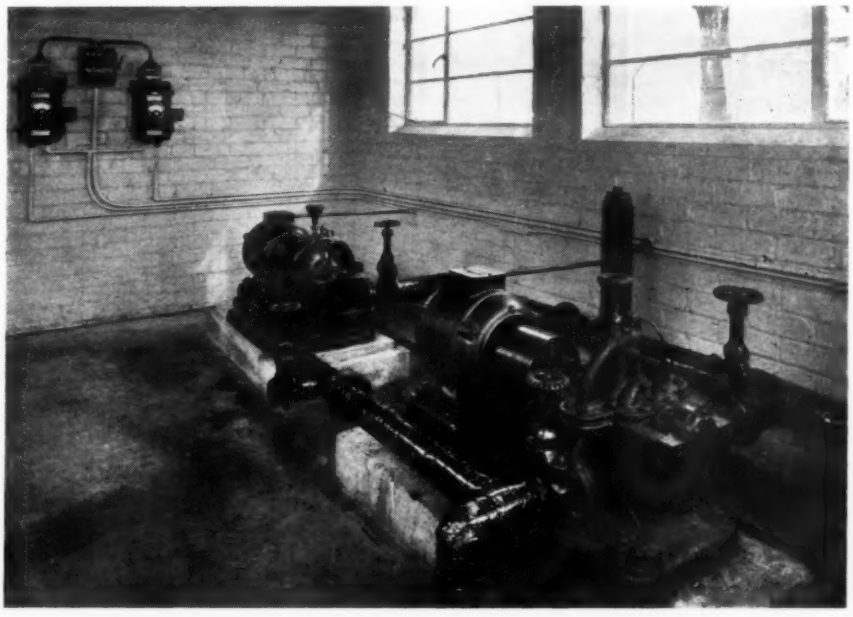
An aluminium factory is being erected at Pont-de-Lescun, in the Aspe Valley, between Oloron and Le Somport in the Basses Pyrénées, states the *Chemical Trade Journal*. The factory is being constructed by a subsidiary of the Société des Forces Motrices du Béarn, which already possesses electric furnaces at Bédous, not far from Lescun. Most of the plant and equipment is being imported from the U.S.A., and it is expected that the installation will be completed towards the end of the present year.

Too Many Technical Terms. By C. R. Cosens

Are "memorial" units essential?

UNTIL the beginning of the nineteenth century, scientific papers of any importance were written in Latin, so that the worker could read of advances in any part of the world at the cost of learning one foreign language. The modern worker has lost this advantage; it is now almost impossible to keep in touch with progress all over the world in any particular subject without being able to read English, French and German, at least with some facility, to which we shall shortly have to add Russian.

The reason for abandoning Latin in favour of the vernacular as a medium for scientific papers was that it was felt to be undesirable that knowledge should continue to be an esoteric mystery, intelligible only to those who had been able to afford a "sound classical education." That this reason for abandoning the universal intelligibility of Latin was good and sufficient is generally accepted (*pace* certain members of the Classical Association); but if new technical terms are introduced in unnecessary profusion, the reader whose "shop" is not exactly the same as that of the writer finds that a paper written in his own language is almost as unintelligible as if it were written in Chinese! This applies most forcibly to the giving of special names to new units of measurement, which the unfortunate student is expected to learn by heart, a process no less difficult than that of learning Latin vocabulary, and fraught with more dangers from faulty memory, since there is no help to be derived from the context.



Water supply pumps with change-over switch and automatic float switch control at the Hull cod-liver oil works (See preceding pages)

That *some* technical terms and units are necessary must be at once admitted (try to write an explanation of a valve amplifier employing only words found in Dr. Johnson's Dictionary!), but electrical science of to-day employs twice as many as we need. International electrical commissions are the worst offenders, inventing new units for the sole apparent reason that they may be given names which will perpetuate the immortal memory of some deceased physicist (surely unnecessary if the said memory is indeed immortal).

Magnetic Units

Let us begin our pruning where the growth is thickest and most tangled—among the magnetic units; two names would suffice, but the wretched student is expected to know fire, the *maxwell*, *weber*, *gauss*, *gilbert* and *oersted*. How many engineers, or even mathematical physicists, would correctly define them all "without the book"?

If we consider magnetic flux, ϕ, as fundamental, the official unit is the *maxwell*; the engineer usually speaks of "10^8 *lines*" instead of 10^8 maxwells, and he will probably continue so to do, international commissions notwithstanding. The term "line" is not self-explanatory, and it must be admitted that maxwell is the better. The *weber* is only 10^8 maxwells, we do not need both, one or the other should go; if the Giorgi M.K.S. system were adopted the weber would become the new "absolute" unit, and the maxwell would disappear, otherwise retaining the C.G.S. system we should abolish the weber.

Flux-density, B, is naturally expressed in *maxwells per sq. cm.*; then why not say so, instead of inventing the name *gauss*? The mechanical engineer is content to express a stress intensity in lb. per in., he does not find it necessary to invent a new unit, calling it, say, a *hooke*, and make every student remember how it is defined. Magneto-motive force, $\int Hdl$, is expressed in *gilberts*, but then why must we measure H in *oersteds*, instead of in "*gilberts per cm.*"? One or the other should go; it does not much matter which, but *gilbert* can become *gil*, as *ampere* has become *amp.**; as *oer* is not a euphonious abbreviation for oersted, we might retain the gilbert and replace the oersted by *gil per cm.*

But we can make more fundamental clearances, discarding not merely names of units, but complete conceptions. Is the idea of magnetic reluctance of any real value? It is usually suggested that it is conceived by analogy with electrical resistance. We define resistance as p.d./current, R=V/I; this is *not* Ohm's Law, although not only students but writers of textbooks have been known to state that it is. R=V/I is merely the definition of what we mean by resistance, Ohm's law states that, so defined, *resistance is constant* for any given conductor. Ohm's law is true for most conductors, deviations due to temperature, &c., being dealt with by small "corrections"; it is this *constancy* which makes the conception of resistance of real practical use. Magnetic "reluctance" can never be regarded as constant, even as the wildest of approximations; hence its use saves neither time nor mental effort, so that its practical value becomes "vanishingly small" and students should not waste their time learning what the word means. Would Young's Modulus ever have been invented and christened if it were not approximately constant for a given specimen?

I would also suggest, though with some diffidence, that we might dispense with the idea of *permeability*, at any rate for ferromagnetic materials, where we cannot expect more than "graphical" accuracy. We generally require to find the value of H corresponding to a given B, or vice versa, and we have to make use of a "B-H curve," plotted to show the relationship, since this cannot be expressed by a mathematical formula; to use a curve plotted with μ as one of the variables would simply be a waste of the time necessary to multiply or divide on a slide-rule. When dealing with ferromagnetic materials, permeability is merely the result of dividing B by H. So far from being constant, the result varies over a range of some thousands to one. It is therefore unreasonable to suggest that its utility is inversely proportional to its percentage variation?

What would have happened if the curve relating B and H had been susceptible of a simple mathematical representation, say $B=k\tanh H$ (which is vaguely the right sort of shape). Probably k would have received recognition, such as has been awarded to the "Steinmetz coefficient" in the empirical equation $h=\eta B^{1.6}$, but it seems unlikely that anyone would have supposed that the ratio of $k\tanh H$ to H was deserving of the special title and symbol, "permeability, μ."

Those materials which for every-day purposes are lumped together as "non-magnetic," but which in more refined work have to be classed as diamagnetic or paramagnetic, have a special interest for the atomic physicist on account of the light they throw on the constitution of matter. For the discussion of the properties of such materials, permeability has its uses, but is not its value in these cases almost entirely due to the fact that at any given temperature *it is constant* for these materials? Even here, *susceptibility* ($\mu^{-1}/4\pi$) seems even more convenient. I suggest that one or the other (but not both) be retained by the atomic physicist, if he finds it necessary for his special purposes, but that for ferromagnetic

* And as, in America, it seems that *henry* is becoming *hen*, in a recent textbook we find mention of "an inductance of 354 *microhens*."

Rupturing Capacity. By W. G. Briggs

Low-voltage switchgear and motor starters

SOME fifteen to twenty years ago an electrical engineering firm in the North of England received a query from its London office in the following terms: "Upon following up your tender for starting gear we find our prices are favourable, but our competitors have given certain information relative to breaking capacity. What figures can you give for our gear?" The facetious reply was: "The breaking capacity of the gear we have put forward is at least 10 per cent. higher than the figures given by our competitors."

In those days the question of rupturing capacity was rarely raised, except in connection with plant for generating stations, sub-stations and one or two large industrial systems. Papers read at the Institution of Electrical Engineers usually dealt with the best methods of calculating with fair accuracy what a given high-voltage switch might be expected to rupture at at any given point on a distribution system. Nobody worried about low-voltage gear. The "assigned" rupturing capacity of a particular switch was often a figment of the imagination. Even in connection with Corporation contracts, circuit-breakers have been "guaranteed" to rupture 100,000 kVA by one firm, whereas another firm had only guaranteed 30,000 kVA for a circuit-breaker of similar size and ampere rating. In both these cases the "guarantees" were not supported by actual tests, as no plant was available for carrying these out on a large scale.

Years before the advent of the grid it was recognised that for many situations it was not a wise policy to install switchgear which could not be guaranteed to rupture a certain power under fault conditions, and now several stations exist for testing such switchgear and producing oscillograph records.

Too Cautious

Rupturing capacity is, however, becoming somewhat of an obsession and a major issue under conditions which do not warrant the importance attached to it. The following examples of many inquiries which are now being received in estimating departments will illustrate what I mean:—

(1) A consulting engineer draws up a specification for private plant, which will never run in parallel with any outside system, comprising two 300-kVA, 400-V alternators, and stipulates a rupturing capacity of 50,000 kVA, whereas the maximum short-circuit kVA with which the switchgear can be called upon to deal is only about 4,000. A consultant naturally requires a margin of safety, but is it fair to the ultimate purchaser to have the cost loaded up unnecessarily?

(2) A small concern requires airbreak starters for motors up to 10 h.p. and the inquiry asks for the rupturing capacity to be stated.

(3) A Government department requires some low-voltage distribution gear, and in specifying a rupturing capacity of 10,000 kVA demands copies of test certificates.

Large Margins of Safety

Commercial starting gear is not manufactured to rupture large fault currents. B.S.S. 587 of 1935 states that "as a standard model is not designed to rupture a short-circuit, a circuit-breaker or fuses of adequate capacity should form part of the installation in order to cope with such a contingency." It also stipulates that "commercial models shall be capable of breaking the current which occurs on overload provided that it does not exceed six times the normal full-load current of the motor protected," but in most cases ordinary commercial starters should rupture with safety at least twenty times normal full-load current where airbreak starters are employed, and sixty times if the starters be oil-immersed.

Starting gear for power station auxiliaries is on a somewhat different footing, but more often than not it falls within the following four classes:—

(a) Commercial starters of a current rating to suit the motor controlled, but not suitable for interrupting short-circuits.

(b) Commercial starters of a current rating to suit the motor controlled, provided with three single-pole fuses for interrupting short-circuits up to 25,000 kVA.

(c) Heavy-duty starting gear with overloads wound to protect the motor, but of itself mechanically and electrically capable of interrupting short-circuit currents up to 100,000 or 150,000 kVA.

(d) Heavy-duty starting gear with overloads wound to protect the motor but of itself capable of interrupting short-circuits up to 150,000 kVA; when the fault current to be broken is beyond the capacity of the switch, a lock-out relay prevents the switch opening and ensures that the circuit is broken in safety by a larger switch nearer the source of supply.

As regards (b), the arrangement would not appear to be very satisfactory when used, for example, with squirrel-cage motors, because the high-rupturing capacity fuses are connected in the line side of the starting switch and pass the initial rush of current at starting, whereas the overloads on the starter are cut out of circuit in the starting position and are wound to give normal overload protection when the motor has "got away." Consequently, the starter would almost certainly interrupt a short-circuit before the fuses could come into operation. The only way of ensuring that the fuses would interrupt faults would be to sacrifice overload protection of the motor and arrange the overload trips with a very high tripping point.

Present Position Unsatisfactory

The present position is unsatisfactory to manufacturers and to purchasers, but it will exist so long as there is no concerted action or until provision is made for actual tests on all sorts of control gear. The three existing testing stations are owned by manufacturers who are in a fortunate position compared with their competitors, and it seems clear that some sort of independent authority, similar to that at Buxton for testing flameproof gear, should be instituted.

More than one switchgear designer, who saw tests carried out at the ancient Carville generating station on a 6,600-V oil switch which was not a fit subject for test and was not designed to rupture anything in particular, has had a "bee in his bonnet" ever since and has felt obliged to "assign" to other products made by his firm kVA figures much lower than would have been the case had he not had this sobering experience. One must admire his rectitude, even though it must have had an adverse effect upon possible business.

Pending a satisfactory solution of the present position, sales engineers must endeavour to curb their Mephistophelean proclivities, which are often brought into play whenever, for example, two firms have submitted tenders on a competitive basis, and the representative of the one which is on the point of losing the business mentions, with a certain ingenuousness, "What about rupturing capacity?"

In conclusion, sales engineers often accuse designers of keeping too much in hand for eventualities, while designers retaliate by accusing sales engineers of having no conscience. Both attitudes have some justification.

Too Many Technical Terms (*Concluded from preceding page*)

materials both be abolished as being too inaccurate for use.

Turning from magnetism to electricity, do we really need both *ampere* and *coulomb*? The hydraulic engineer does not need a special name for "gallons per minute." Logically, "quantity" is a more fundamental conception than "rate of flow," but we cannot seriously consider abandoning *amperes* in favour of *coulombs per second*; ampere-meters must outnumber coulomb-meters by millions to one. But it is possible to retain the conception of "quantity of electricity" and yet abandon the name coulomb; how often do we use the word, anyway? Is there any real objection to speaking of *ampere-seconds* instead? The student would understand it at once, as he is familiar with the *ampere-hour* as denoting the quantity of electricity stored in an accumulator; is the very occasional convenience of a special name for the ampere-second sufficient to justify the learning of yet another name and definition? Let us abolish the coulomb, and for a like reason the *joule*, which can be referred to as a *watt-second*.

On the other hand, the *decibel* "fills a long-felt want" and should "receive a hearty welcome" (as the logarithm of a power ratio; it appears that sound intensity in "db above threshold" is to become *phons*); not so the *hertz*, which is only camouflage for *cycles per second*.

After this drastic but necessary pruning we are left with the following names; excepting the maxwell each has its well-known or obvious abbreviation, and we may reasonably expect everyone to understand them:—Volt (V), ampere (A), watt (W), ohm (Ω), henry (H), farad (F), maxwell (?), gilbert (G), decibel (db).

These nine units, with their multiples and submultiples by powers of 1,000, should suffice for all ordinary requirements. If any others are really needed for special purposes, whether by writers of scientific papers or by professors setting examination questions, they should be defined *ad hoc*, as and where they occur; nobody should be expected to try to remember them.

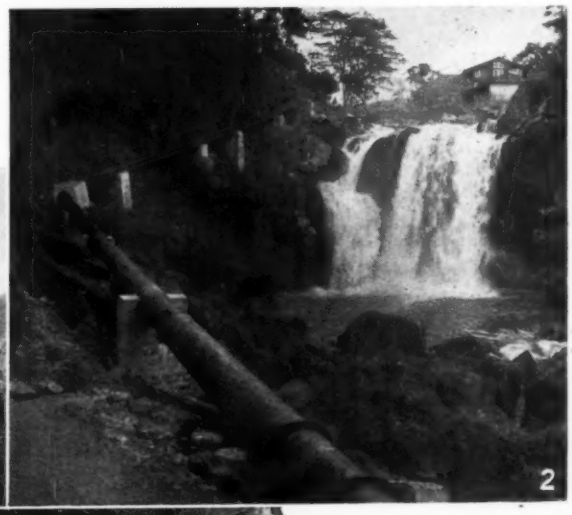
Power in a Tea Factory. By H. Crownshaw

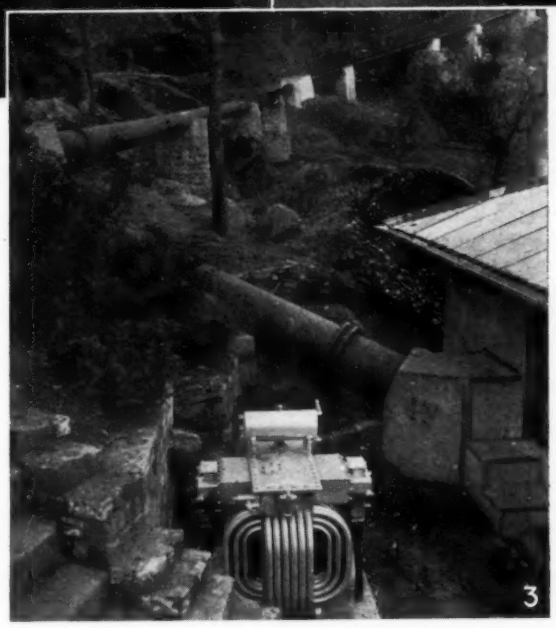
A small hydro-electric plant in Ceylon

CEYLON tea is grown in the mountainous centre of the island at elevations up to 7,000 ft., where the rainfall varies from 80 to over 200 in. per annum. On the western slopes, which get the benefit of rains during both the south-west and north-east monsoons, this rainfall is spread over about nine months of the year. In this area there are more than 1,000 estates varying in size from 200 to over 3,000 acres, and each estate has its own factory in which the complete manufacturing process is carried out.

The power required to drive a tea factory, ranging from about 25 b.h.p. in the smaller factories to over 150 b.h.p. in the larger, is derived mainly from Diesel engines of the solid-injection type, but in some cases water turbines, Pelton wheels, or hydro-electric plant has been installed.

In an efficient tea drier 4,000 B.th.u. is required to dry 1 lb. of tea. As the average crop obtained from one acre is about 600 lb. of made tea per annum and there are over 500,000 acres under cultivation, the power required for tea drying is considerable. At present it is produced by crude oil, coal or firewood. The firewood is grown on the estates or in the surrounding jungles, but all crude oil and coal is imported. With such an abundance of water power available and the prospect of a good load on the very doorstep it is difficult to understand why the hydro-electric resources of the island are not already highly developed.





1. Kirkoswald tea factory. 2. Waterfall and part of pipe-line feeding the hydro-electric plant. 3. Pipe-line entering the power-house, with step-up transformer in the foreground

Shortly after the war plans were prepared for a hydro-electric installation at Laxapana, in the centre of a large tea-growing district. This was to be installed by the Government and was designed for an ultimate output of 300,000 b.h.p. on a gross head of about 2,000 ft. Little progress was made from 1924 when the work was started until 1930 when all work was stopped owing to the depression, since when no further progress has been made.

A modern tea factory, designed for an output of one million pounds of made tea per annum has been built recently on the Kirkoswald estate, situated at an elevation of about 5,000 ft. in one of the best tea districts in the country. A stream flows along the boundary of the estate with a minimum dry weather flow of 25 cusecs, in which there is a waterfall with a sheer drop of 60 ft. At a point 300 yd. above this fall diversion works have been erected consisting of two sluice gates and a substantial masonry wall. This wall protects the diversion works during periods of flood, when the river level may rise several feet in a few minutes. The water flows thence for 150 yd. along what was originally a branch of the main stream around a small island. At the end of this channel a weir has been built to form a forebay and silt trap, from which a tapping is taken into a reinforced-concrete watercourse of rectangular section at right angles to the direction of flow into the forebay to allow as much as possible of the debris which comes down the stream, during flood periods, to be carried over the weir instead of into the screens protecting the entrance to the watercourse.

Directly above the waterfall a head tank fed by the watercourse, has been built from which water is carried to the turbine by a 410-ft. pipe-line built up of 27-in. Stewart & Lloyds lap-welded steel tubes. Where this pipe line passes over the cliff, anchor points are arranged at bends which are securely fixed to natural ledges on the cliff. Spans of up to 50 ft. have been taken between supports and expansion joints are fitted between the three main anchorages. To give easy access between the power house and the head work a footway has been built on the pipes between the base and top of the cliff.

A 200-b.h.p. 1,000-r.p.m. Boving-Francis type turbine works under a gross head, including suction, of 85 ft., an oil-pressure governor retarding the closing of the turbine gates to prevent excessive rise of pressure in the pipe-line. The suction head is 17 ft. and the suction pipe is fixed at an angle of 40 deg. from the horizontal into a natural cleft in the rock, thus simplyfying erection.

Directly coupled to the turbine is a Crompton three-phase alternator with an output of 200 kVA, at 0.7 p.f., 400 V, 50 cycles. This machine is constructed to withstand the mechanical stresses imposed if the speed of the set should rise 80 per cent. above normal due to governor failure.

A Crompton "Klad" control panel mounted alongside the alternator is equipped with over-voltage and earth leakage relays as well as overload and no-volt protection. The over-voltage relay trips the main circuit-breaker and an automatic field breaking switch if the voltage between phases exceeds 500, which gives the necessary electrical protection to the alternator should the turbine governor fail. The earth-leakage relay is operated by current between neutral and earth on the high-voltage side of the step-up transformer. Automatic voltage control is provided by an Isenthal type "MS" voltage regulator also fitted on the control panel and driven by a 1/20-b.h.p. Crompton "Minor" motor.

For transmission the voltage is stepped up to 6,600 by a B.E.T. Co.'s self-cooled delta-star 200-kVA transformer erected outside the power house. A similar step-down transformer is erected at the factory end of the line and both neutral points are earthed. Conservator tanks and calcium-chloride breathers

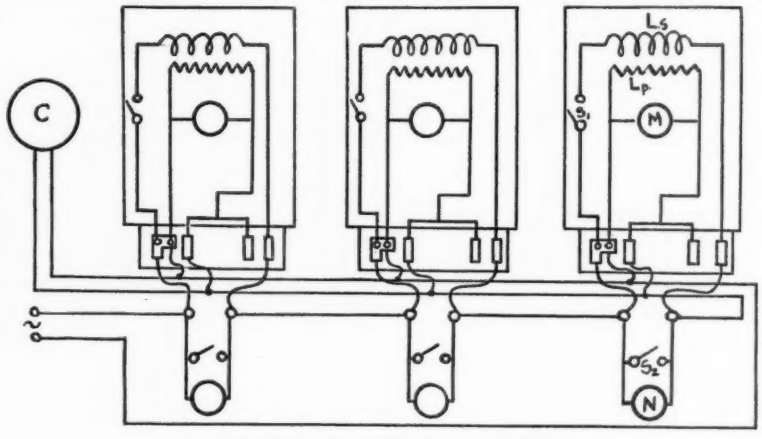
Testing Prepayment Meters. By J. Bailey

How to check coin-collecting mechanism and calibration

IN many areas, particularly those that have suffered from the effects of industrial depression, the two-part tariff meter has proved to be a valuable revenue-earner for suppliers of electricity. This type of instrument, originally introduced for collecting fixed and consumption charges, is in addition now being widely employed for recovering, in instalments, the cost of assisted wiring and/or appliances installed on the hire-purchase system.

For such purposes, beside the standard prepayment element and mechanism, a small synchronous motor is incorporated to drive the meter towards zero credit. The rate at which this takes place, in terms of cash collected, is adjustable between certain limits, and it is therefore necessary to ensure that the instrument will collect with reasonable certainty the weekly sum for which it is calibrated.

Thus a need has arisen for an additional test over and above those to which meters of standard type are usually subjected. Such a test, to be of value, should cover at least forty hours and be applicable to meters in quantity, without demanding any attention other than that involved in checking the performance on completion of the test cycle. Without special arrangements such a test is both lengthy and tedious, and it was with the object of eliminating these objectional features that I tried the system herein described.



Method of connecting meters for test

C, Synchronous clock. L_s, series coil. L_p, potential coil. S_1, meter switch. S_2, short-circuiting switch, N, neon pilot lamp.

Briefly, the method adopted is to connect all the synchronous motors in parallel and the meter switches in series. The bank of motors is then fed from the mains, *via* the meter switches, in such a manner that the opening of a switch stops all the synchronous motors and suspends collection. A neon pilot lamp is connected in parallel, across each meter switch, so that the opening of any individual switch is indicated by the striking of the particular neon lamp appropriate to the meter in question. The motors will not start or run in series with a neon lamp, and it was for this reason that such lamps were used. Indication will occur if two switches open simultaneously, but not for more than two. However, the chances against even two switches operating together are very high, and as a matter of fact this has not, so far, occurred in practice.

Short-circuiting switches are provided for each meter, so that after the switch has functioned in the meter the remainder of the meters may be restarted. Time indication is provided by an electric clock, which is connected in parallel with the synchronous motors, and thus is stopped by the opening of any individual meter switch. The method does not call for the disconnection of comparatively inaccessible wires inside the meters, and it is a simple and rapid procedure to connect a number of meters in the manner described.

In the department with which I am associated the meters are for testing purposes usually calibrated to collect four shillings per week. The switch should remain closed for 42 hours after the insertion of one shilling. Assuming that the meters were started at, say, 10 a.m. Wednesday, the switches should operate at 4 a.m. Friday. The first switch to open may do so at, say, Thursday midnight. All the meters and the electric clock would stop at that time.

The person in charge of the test, arriving on Friday morning at 9 a.m., notes that a certain meter, indicated by the pilot lamp, has operated at 12 midnight. He notes that the meter was four hours fast, and, after checking the time, starts the remaining meters by closing the appropriate switch. The meters have now run for 38 hours, so that, assuming they were restarted at 9 a.m., they should operate at 1 p.m.

This procedure is followed throughout, constant supervision being unnecessary. The advantage of the system is that the testing engineer is at liberty to attend to the board at his own convenience.

Power in a Tea Factory (*Continued from previous page*)

with oil seals are fitted to both transformers, while the connections between the transmission line and the high-voltage windings are made direct with a length of Glover's non-bleeding armoured cable. Three-phase wires of 8 s.w.g. hard-drawn bare copper and a continuous earth wire of 7-14 galvanised-steel have been used for the mile of transmission line, the spans of which vary between 60 and 300 ft. owing to the broken nature of the country. Its design was simplified as ice loadings had not to be allowed for. Rolled steel joists of "H" section (4 by 3 in. for the shorter spans and 5 by 4½ in. for the longer) were the cheapest supports obtainable. Wooden poles could not be used as timber buried in the ground would be attacked by white ants. Lightning protection is provided at each end of the line by Ferranti surge absorbers. Single pole isolators are fitted in each phase to facilitate testing of the line and transformers.

A Crompton "Klad" distribution panel is fitted in the factory engine room. The main motor, a 125 b.h.p. slip-ring type by the same makers, transmits its power to the factory line shaft through a Dick's "Rubberix" belt of 12 by 10 mm. Standby power is provided by a 144-b.h.p. oil-engine (giving 115 b.h.p. at site due to elevation), which also drives the line-shafting by a belt, clutch pulleys being fitted on the line-shaft for both drives. The second motor is erected in a pump house, about 1,200 yd. from the factory, driving a reciprocating pump which gives a supply of clean water to the factory. This motor is fed from a low-voltage three-phase four-wire line which also gives a supply to the staff bungalows for lighting, heating and cooking.

Electricity for lighting and driving the pump, when the factory is being driven by the oil engine, is generated by a Crompton 20-kVA alternator driven from the line-shafting through a countershaft. This machine has a compound winding fed through a rectifier by the secondary winding of a transformer connected in the alternator phases. This arrangement gives a regulation of plus or minus 5 per cent. at constant power factor.

The main consideration in the design of this plant was to keep capital cost to the lowest possible figure. Actually, the all-in cost of the complete scheme, with the exception of the oil engine, was £37 10s. per kW, at which price a handsome return is shown on the investment. The material had to be transported over precipitous ground and also to pass through a neighbouring estate the owner of which stipulated that compensation must be paid for any damage done to tea bushes. A staging was built down which the packages, guided by coolies, were lowered with a winch. Not a single article was damaged nor a tea bush injured owing to the care with which these coolies carried out their work.

Receiving Sets in Norway

The chairman of the Norwegian Radio Merchants' Association reports that just before the end of 1936 it was impossible for the dealers to satisfy the demand for cheap wireless receiving sets of the national type of the price of about 120 kr. The increase is largely due to the extended application of the instalment payment system.

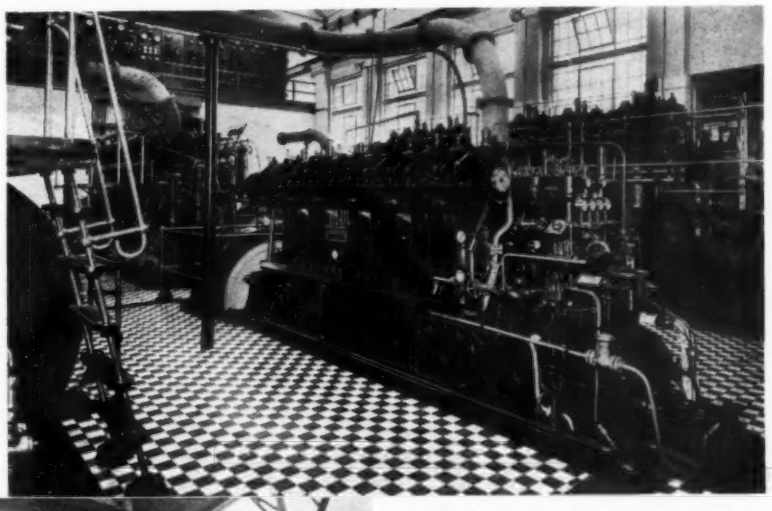
Loughborough College Power Station

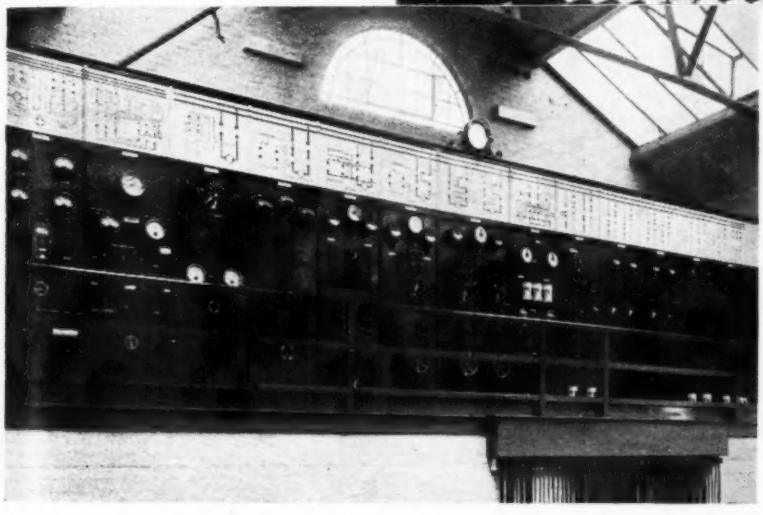
THE south-east block of Loughborough College, including the new power station was opened on January 21st by Mr. C. Day, past-president of the Institution of Mechanical Engineers. From 1925, when the plant started to supply electricity to the College, until 1933, when the erection of the new station building was begun, the engines were housed in wooden huts occupying the same site. The original 1,850 and 550-b.h.p. Diesel d.c. sets were assembled without drawings from plant taken from captured submarines (which included a 120-cell battery) supplemented by a 60-b.h.p. Allen-Siemens d.c. steam set. In its first complete year it generated about 150,000 kWh, and by March 31st last this had increased to 450,000 kWh; during this period supply has been maintained without interruption.

In addition to these units the new station contains a 330-b.h.p. Mirrlees six-cylinder engine coupled to a 200-kW Brush alternator, a 170-b.h.p. Vickers-Petter engine with Crompton generator, a 200-kVA Brush three- to six-phase transformer and rotary convertor, and motor-driven boosters, compressors and circulating pumps. There are also installed a "Streamline" oil filter, an I.C.I. degreasing plant and Morris travelling cranes.

A static voltage regulator (Brush Co.) *via* a Westinghouse metal rectifier. In parallel with the secondary are a rheostat to control the compounding from zero to maximum and barretters to influence the shape of the characteristic. Although the exciter has a straight low-load characteristic, the current in the field winding is not strictly proportional, so that the two curves intersect.

Exhaust gases can be passed through a Cochran calorifier which serves the whole heating system of the new block of buildings, thus saving £160 per annum. A boiler fired with waste oil from the generating station and garage comes into the heating system automatically when the heat from the engine stops.





The engine room (above) and switchboard at Loughborough College

Accommodation is provided in the south-east block for a garage and workshop on the ground floor, a hosiery machine shop on the first floor, and a dyeing laboratory, hosiery conditioning room and drawing office on the second floor. The top floor is occupied by a handicraft workshop. Knitting and winding machines in the hosiery section are arranged in three groups, each with a line shaft driven by an electric motor. An all-electric conditioning oven is an outstanding item in the textile testing room.

In the handicraft workshop are, in addition to thirty-six single wood-work benches, circular and band saws, a planer, a wood-turning lathe and a grinder, each driven by its own electric motor. The electrical work was carried out by A. R. Smith & Sons and A. Marriott, Ltd.

Electricity Supply in Portugal

A REPORT recently issued by Mr. Ferreira Dias, chief engineer to the Portuguese Government Department of Hydraulic and Electrical Services, shows that at the end of 1935 there were 603 generating stations in the country with a total installed capacity of 233,427 kW, compared with 602 and 210,762 kW, respectively, at the end of 1934. Of these, 98, representing 65,592 kWh, were hydro-electric. Stations engaged in providing a supply to the public and for traction purposes numbered 171 (174,189 kW), while 432 (59,238 kW) were privately owned. The total output of electricity in the country during 1935 is given as 355.6 million kWh, an increase of about 9.4 per cent. over the previous year. Hydro-electric plants were responsible for 116.5 million kWh. The number of consumers increased from 249,000 to 266,000. The areas of greatest consumption were the Lisbon district (105.7 million kWh) and Oporto (80.4 million kWh). The textile industry consumed 61.9 million kWh, the pottery and building trades 27.9 million kWh, food preparation apparatus 23.4 million kWh, metallurgical and mechanical industries 13.9 million kWh, water pumping plant 12.1 million kWh, the chemical industry 8.5 million kWh, and the paper trades 4.9 million kWh. A further table shows that of the 6,360,000 population of the country, electricity supplies were being taken by 3,048,000. The annual consumption per person to whom public supply was available ranged from 9.6 kWh in the province of Braganca to 142.2 kWh in the Lisbon area and 116.6 kWh in the Oporto district; the average for the whole country was only 76.9 kWh per year, this being, however, a marked advance over 1934. As regards distribution, there were about 2,536 miles of high-voltage lines in Portugal; about 2,256 miles were overhead, of which 1,657 miles were operated at up to 25 kV, 348 miles between 25 and 50 kV, and 251 miles at over 50 kV.

All-electric Flats in Prague

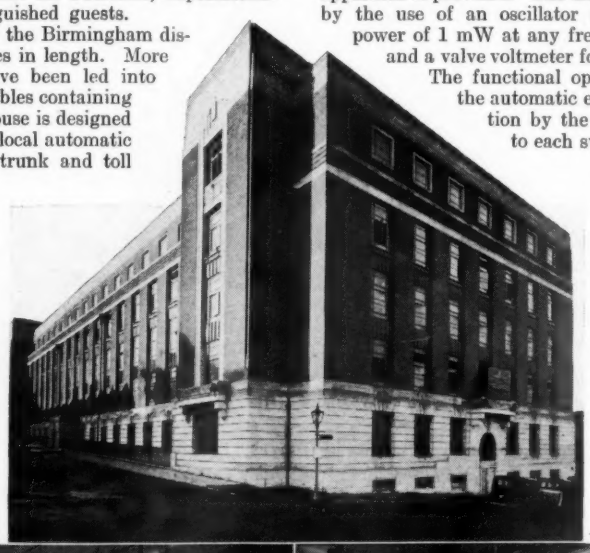
Since the first experimental all-electric apartment flats were built in 1932 over 2,000 have been erected in Prague. They are almost all designed on the same lines, comprising two rooms and a kitchen equipped with a small cooker having two hot plates of 800 and 1,200 W, respectively, and an oven of 1,000 W. There are also installed electric refrigerators and electric water-heaters, and provision is made for the use of other domestic appliances, such as vacuum cleaners, toasters and fans. The cost of electricity in flats comprising two rooms and kitchen, is from 50 to 100 crowns per month, the higher figure being for the winter consumption when the heating apparatus is in operation, and about 100 to 150 crowns for three rooms and kitchen (140 Czech crowns = £1). In the course of the current year nearly 1,000 new apartments of the fully electrified type have been completed.

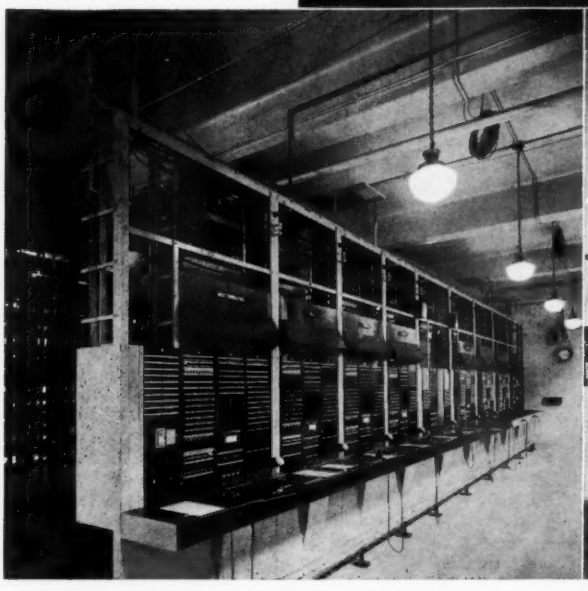
Birmingham Telephone Headquarters

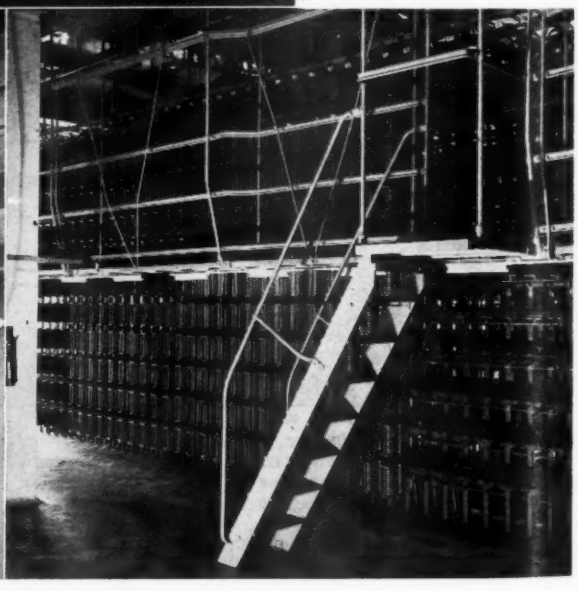
Inauguration by the Chancellor of the Exchequer

BIRMINGHAM is the largest provincial centre for long-distance calls and the volume of traffic which terminates or passes through the city has necessitated the provision of a new five-storey building at a cost of £600,000. The ceremonial opening was performed on January 21st by Mr. Neville Chamberlain, Chancellor of the Exchequer, in the presence of Major G. C. Tryon, Postmaster-General; Ald. H. Roberts, Lord Mayor; Mr. T. B. Braund, postmaster-surveyor; Mr. H. Faulkner, superintending engineer, and other distinguished guests.

The underground network in the Birmingham district is now nearly 500,000 miles in length. More than 50,000 pairs of wires have been led into the new building, some of the cables containing 1,400 wires each. Telephone House is designed to accommodate two 10,000-line local automatic exchanges, in addition to the trunk and toll exchanges and a repeater station. The first auto-exchange (for 6,000 subscribers' lines initially) is in process of installation by Siemens Brothers & Co., Ltd., who have already completed the trunk and toll exchanges. Each deals with 30,000 calls per day, there being 367 operating positions (190 for trunks) and 79 relay-set racks are provided to mount the present 6,333 relay sets associated with trunk and toll circuits. The total number of relays in the three exchanges is 111,000. The repeater station is being installed by the General Electric Co., Ltd.







Top: General view of the building. Bottom left: Trunk and toll test racks. Bottom right: Main frame of the trunk and toll exchanges

The "Central" Exchange on the ground floor is of the latest line-finder type, the focus of thirty automatic exchanges in the Birmingham area. The trunk and toll traffic is operated manually, the switchboards being on the top floor and the apparatus on the second floor. Automatic devices indicate which circuits first become available on the various routes and measure the duration of calls. High quality transmission is ensured by the use of the "sleeve control" system in which all signalling apparatus is clear of the actual speaking circuit.

A large proportion of the trunk circuits in the country is now carried in underground cables and the transmission losses over the cables are compensated for by the inclusion of thermionic valve amplifiers or repeaters located at intervals *en route*. At an early date a system of signalling between exchanges with currents within the voice-frequency range will be introduced and it will then be possible to amplify these signals by the same apparatus as is used for the amplification of speech currents. The introduction of this method of signalling should ultimately enable the operator at any trunk exchange to dial directly into the automatic system at the distant end of the circuit. The equipment at Telephone House is designed to facilitate the introduction of this method of signalling by lamps on the switchboards supplied with a.c. at 6 V obtained by transformation of the public supply. A stand-by for the calling signals is available from a 6 V tap off the main battery.

A very complete equipment for testing both lines and apparatus is provided. The transmission efficiency is measured by the use of an oscillator designed to supply a constant power of 1 mW at any frequency from 50 to 12,000 cycles and a valve voltmeter for measuring the power received. The functional operation of the various items of the automatic equipment is kept under observation by the use of routiners, applying tests to each switch in turn. In case of failure the routiner will stop and indicate the number of the faulty switch and the nature of the defect. All the trunk and toll circuits are connected *via* a test rack at which the condition of the line can be tested, or the location of a fault determined by the use of a bridge "Megger." On this rack keys are provided by means of which any faulty circuits can be put out of service. Cables are tested for insulation at periodic intervals and incipient faults are localised by means of a precision test set consisting of a high quality Wheatstone bridge with a reflecting galvanometer. It is possible to locate an earth fault of several hundred ohms to within one-fifth of a mile on a cable 100 miles in length.

Electric power is obtained from the Birmingham Corporation mains at 11,000 V and transformed down to 440 V. Two motor generators of 135 h.p. are provided for charging the two Chloride 50 V, 9,900 Ah storage batteries,

The 97-ft. long switchboard is believed to be the largest of its kind in Europe. In the switchroom 400 operators can work at once, the cables on and between the various sections running to 188 miles and the total internal cabling to 631 miles. The installation involved the soldering of 5,600,000 joints, and 226,000 call lamps, 30,000 fuses and 14,900 jacks were used. The entire plant is earthed to two strips of lead, each 100 ft. long, connected to a further 100 yd. of cable an inch in diameter and buried in the ground.

The Postmaster-General announced that the Post Office was now employing 19,000 more staff than it did eighteen months ago. In 1936 new telephones installed numbered 238,000, compared with 183,000 in 1935.

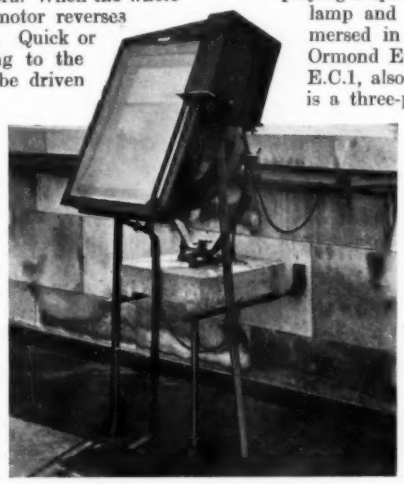
Coronation Illuminations

SINCE our special issue appeared on January 15th details of further new equipment for the Coronation have come to hand. An interesting development is the "Apex" floodlight colour screen, made by the Apex Advertising Agency, Ltd., Parliament Mansions, Orchard Street, London, S.W.1, to enable variable coloured floodlighting to be obtained from standard projectors.

The Graham-Farish floodlight projector

The screen, which takes the form of a rectangular box, contains a roll of translucent material divided into six sections of different colours. The roll is driven through a worm gear and chain by a 1/20 h.p. electric motor fixed in a waterproof casing at the side of the screen, the coloured roll being drawn across the floodlight beam in a similar manner to a roll film in a camera. When the whole of the coloured strip has passed, the motor reverses automatically and the process is repeated. Quick or slow changing can be obtained according to the motor gearing, and several screens can be driven by the same motor through coupling rods.

Unusually low price is the feature of the floodlight of Graham-Farish, Ltd., Masons Hill, Bromley, Kent, which, although very simple in design, is adjustable to any angle and fitted with a focusing device. The front is rapidly removable, no screws or clips being employed, and the vents are claimed to be rain- and fly-proof. The base is designed to allow the lamp to be stood without fixing, and coloured glass screens can readily be fitted; heat-resisting glass is obtainable and the glass edge and rim are protected by rubber. Two models are available for 150-W and 300-W (max.) lamps; the smaller model when fitted with a mirrored reflector and focusing adjustment of 1½ in. can be used as a spotlight.



The "Apex" screen

New striplight holders: Left: "Ediswan"; top right, Kniveton; bottom right, Ormond

Three new striplight lampholders have recently made their *début*: The "Ediswan" (Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2) is unusual inasmuch as it includes special arrangements for separating the two poles of the cable where the contact prongs are inserted. By employing a special rubber sleeving to cover the top of the lamp and the holder the whole fitting can be immersed in water with safety, a feature which the Ormond Engineering Co., Ltd., Rosebery Avenue, E.C.1, also claims for its new bakelite holder. This is a three-piece moulding without screws, the cable being secured by tightening up a locking ring. For surface wiring the base may be screwed down on to a board.

A complete "illumination kit" is being produced by Kniveton Cable Works, Ltd., Queensway, Enfield, comprising twelve striplight holders and lamps evenly spaced on 12 yd. twin 7/029 t.r.s. cable. Striplight is, of course, also made up to specification.

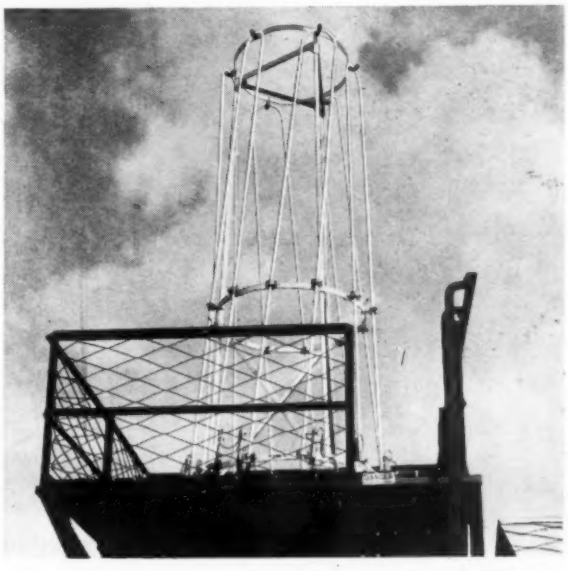
The Selfix Transfer Co., 5, Brickhill Lane, Upper Thames Street, London, E.C.4, is supplying eleven-colour translucent washable photographs of their Majesties King George VI and Queen Elizabeth, mounted on glass and fitted with an electric lighting unit for rear illumination. With a gilt frame these measure 18 in. by 24 in. or 12 in. by 6 in.

Electrical Aerodrome Equipment

AT the exhibition of aerodrome equipment held at the Central Hall, Westminster, by the Aerodrome Owners' Association last week various kinds of lighting equipment, such as boundary lights, beacons, floodlights, electric-discharge lamps, landing floodlights, &c., were exhibited by the British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., the General Electric Co., Ltd., and Chance Bros. & Co., Ltd.

Various types of accumulators and batteries both for aircraft and aerodromes were shown by the "Ediswan" Co.: Peto & Radford, who make a special "Dagenite" mobile ground starting trolley consisting of two 6- or 12-V "Dagenite" batteries in series and the Chloride Electrical Storage Co., Ltd., who have adapted the "Keepalite" emergency system for aerodrome use—where a.c. is required for boundary lights a rotary convertor comes into use simultaneously with the automatic switching over to the stand-by supply.

Beside a range of "Hi-power" drills from ¼ to ¾ in., grinders, flexible shafts, garage tool outfits, &c., were shown by Grimston Electric Tools, Ltd., drills and screw guns of various sizes (including new 400 r.p.m. models) also being shown by Desoutter Bros., Ltd. Electric air compressors from ½ to 5 h.p. are made by John B. Pillin, Ltd., who are also makers of electric petrol pumps, while other exhibitors of compressors were Tecalamit, Ltd., and Kurt Erlach, Ltd., who, like the Laycock Engineering Co., Ltd., also make electrically operated spraying equipment. The "Laycock" electric "Niagara" washing plant was shown. Wireless transmitting and receiving equipment and direction finding apparatus were displayed on the stand of Marconi's Wireless Telegraph Co., Ltd., Gambrells, Rowse & Snoaden, Ltd., and Standard Telephones & Cables, Ltd., who showed a working model of the "Lorenz" blind landing system. Cables were exhibited by Callender's Cable & Construction Co., Ltd., while the "Magnaflux" crack detector, made by the Equipment and Engineering Co., Ltd., was also to be seen. Brown Bros., Ltd., exhibited a wide range of drills, polishers, lamps, reflectors, battery charging equipment, &c., and nitrogen type inflation apparatus was shown on the British Oxygen Co.'s stand.



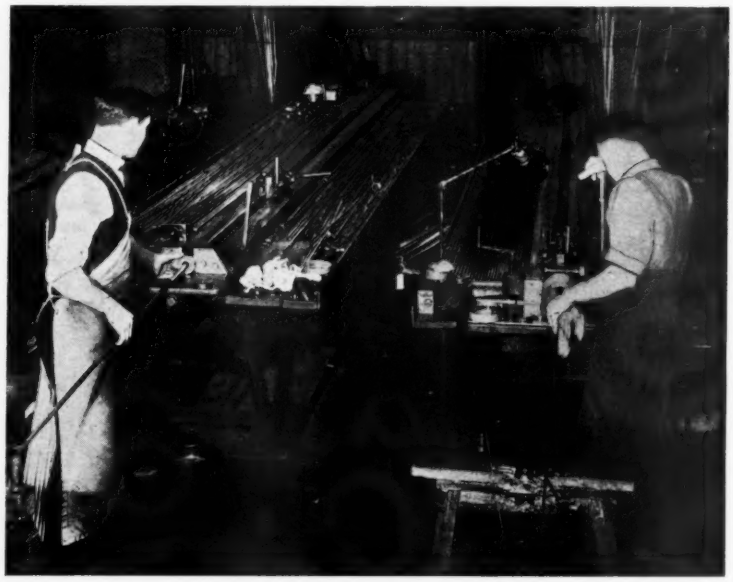
A G.E.C. beacon installed at Croydon Aerodrome

Electrical Contacts. By Edmund Downs, M.Sc., F.I.C., A.M.I.E.E.

The field for precious metals

THE use of precious metals—gold, silver, platinum, palladium, rhodium and iridium and their alloys—for contact work in the electrical industry has developed considerably in recent years. Their employment, owing to their comparatively high cost, is confined at present to small parts where their characteristic properties, such as high melting points, freedom from oxidation and general inertness to atmospheric corrosion at all temperatures, are essential. A further advantage is that the precious metals and many of their alloys are all highly malleable and ductile and can therefore be obtained in the form of thin sheet or wire. This property is of considerable importance as the user is thereby enabled to specify the minimum weight for his particular application and many ingenious methods of manufacture are employed with a view to reducing the weight of the precious metal in actual use.

The extended use of these metals has followed modern extensions and developments in the electrical industry, as for example the wireless television and automatic telephone industry where precious metal contacts are a well-known and essential feature. Advantages resulting from their employment often easily outweigh the usually small extra cost over alternative base metal parts. The latter, moreover, generally require to be of considerably heavier material and of stouter manufacture in order to perform equivalent work or to show as high an efficiency. In many normally expensive electrical equipments, the employment of precious metals at vital points makes practically no material difference to the final inclusive cost. A further consideration is their "scrap" value, as, for example, in the case of magnetos, where the precious metal tip is readily recoverable and saleable when the magneto contact has completed its useful service.

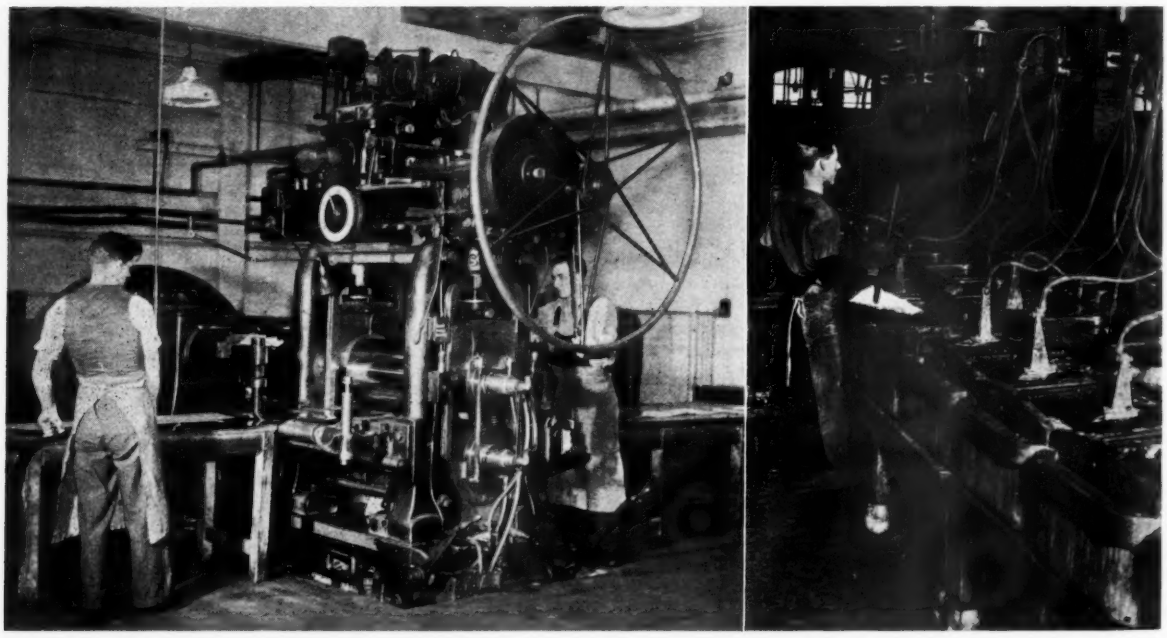


Silver wire drawing operations at the works of Johnson, Matthey & Co., Ltd.

Silver has the highest thermal and electrical conductivity of all metals and is, therefore, eminently suitable for the transmission of large currents or where rapid dissipation of heat is essential. It is, moreover, relatively cheap and is completely resistant to surface oxidation at all temperatures below its melting point, 963 deg. C., and, in common with the precious metal family, it is extremely malleable and ductile. All these properties render the metal specially valuable for electrical equipment parts, and it is no exaggeration to say that millions of silver contacts are in daily use in the electrical industry for automatic telephone installations, relay work, railway signalling devices, control work, switches, and many other applications. It is estimated that in a full-size automatic telephone installation there are at least one million fine silver contacts in general use, the pure metal being employed on account of its high electrical conductivity. Silver is also extensively used in the wave-change switches of wireless sets, for cut-out contacts and lighting control switches.

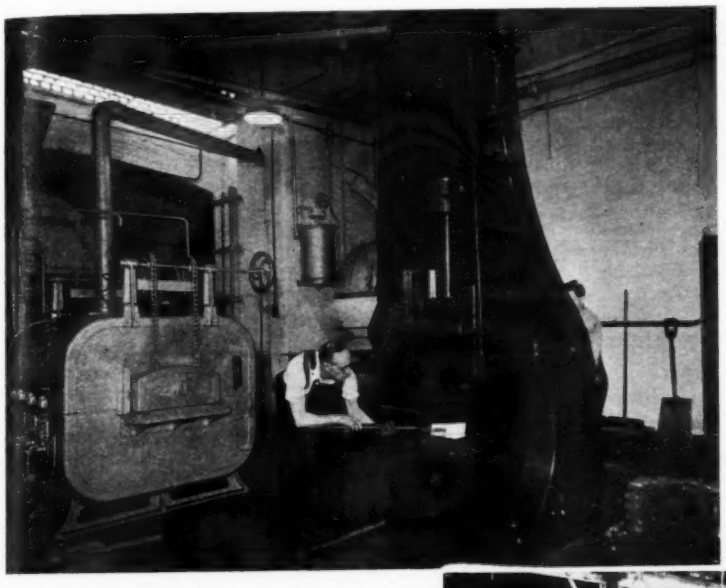
Certain copper-silver alloys, chiefly the standard or sterling alloy, although slightly less resistant to atmospheric corrosion than pure silver and with a melting point of 894 deg. C., find a use in manufacture where a cheaper and somewhat harder material is required to function under conditions where the contacts undergo a wiping action when actual contact takes place whereby the working surfaces are kept clean. Such alloys are also useful where atmospheric conditions are free from sulphur and where oxidising influences are excluded. For these reasons they are used to a large extent on wave-change switches of wireless sets and as contact material in thermostatic and similar control mechanism for which the hardness and relatively high conductivity of the alloy combine to render it specially suitable.

Larger contacts giving greater surfaces of this particular silver-copper alloy are used for the moving finger of relay contacts in automatic signalling apparatus. The fixed contact, where a low resistance is required, as in low-voltage d.c. cir-



Rolling mill for the production of silver sheet, and (right) electrolyte silver refinery

cuits, consists of a small graphite block impregnated with pure metallic silver powder, equal quantities of each being used. In a.c. circuits, where resistance is not so important, a pure graphite block containing no impregnated silver is employed, but in both cases special electrographitic carbon is essential. Alloys of gold and silver are also occasionally specified.



Forging a platinum ingot, and (right) electric silver melting furnaces

In order to conserve the quantity of the precious metal used in contacts generally, a material consisting of a thin facing or inlay of silver welded or soldered on to copper in the form of sheet or wire has found a wide application in the comparatively large contact gear for the transmission of heavy currents.

The contacts are made up in any desired form and are so arranged that only the effective working surfaces consist of silver or silver alloys, thereby allowing the carrying of cessive heating or any other detrimental effects.

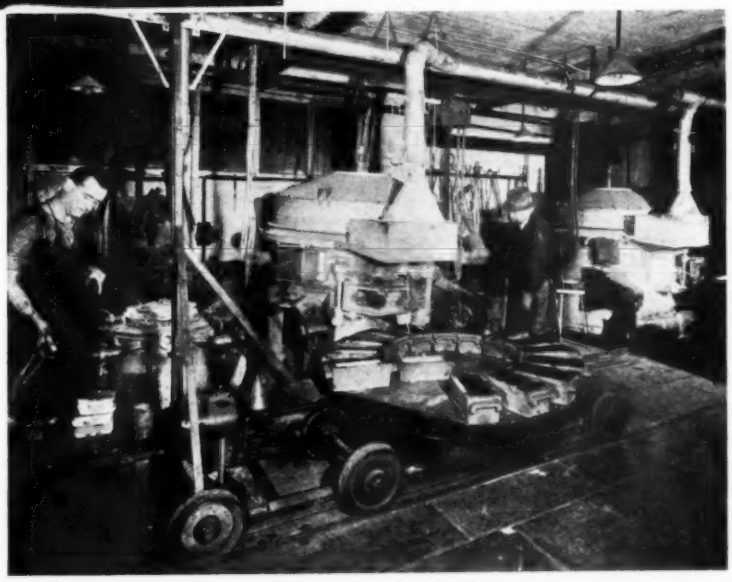
The chief demand for this class of material is in the form of sheet with an inlay of fine silver where necessary, or with one or both faces covered with the precious metal. The basis metal is usually copper, although in some cases phosphor-bronze, brass or nickel are similarly treated not only with silver but also with platinum, gold and precious metal alloys generally.

Platinum metals and alloys find many uses for electrical contacts, but owing to their comparatively high cost they are used only where the conditions are unusually severe or unsuitable for any other metal or alloy. The platinum metals and alloys all have high melting points (the lowest in the series being that of palladium at 1549 deg. C.) and show no corrosion, oxidation or disintegration under the severest atmospheric and working conditions. Of this family of metals, platinum (melting point 1773 deg. C.) is the most widely used and is found in contacts in telephone relay systems as well as in numerous other light-pressure, low-voltage work where the current is slight and where it is necessary to ensure that there shall be absolute immunity from oxide or other non-conducting surface films.

For heavier work and where continuous arcing conditions make a harder material desirable, alloys of the platinum group are used. These include binary or tertiary alloys of platinum with iridium, osmium, ruthenium, rhodium or combinations of these, all of which are inert to atmsopheric conditions, are extremely hard and have very high melting points. Examples of this type of combination of metals are automobile or aeroplane magneto contacts (usually a 10 or 25 per cent. iridium-platinum alloy, welded on to a steel base) which are required to withstand the highly exacting conditions of severe arcing with a continuous make-and-break action at high speed and under heavy spring pressure.

Many of the platinum group are also alloyed with copper for special contact work and for telegraph relays a palladium-copper alloy containing 60 per cent. palladium finds extended use. Alloys of platinum, gold and silver are also in demand for many purposes in this category.

The industry concerned with the refining and fabrication of precious metals is constantly occupied in research with the object of making these metals and alloys of still greater use and accessibility to the electrical industry generally. Many problems and applications both for small and large electrical apparatus still remain to be solved, but with prolonged experience of the many advantages and economies offered by this class of material for contact work, the exceptional and highly desirable properties of the precious metals will find still further scope and development in the electrical industry.



Lighting and Electron Emission

INVESTIGATIONS relating to electric-discharge lamps of the high-pressure mercury-vapour type still form an important part of the work at the research laboratories of the General Electric Co. at Wembley. Luminous efficiency is notably reduced as the wattage ratings go down, and in the larger sizes the position is as follows:—

Rated lamp W.	Initial L/W.	Average L/W up to 1,500 hr.	L/W at 1,500 hr.
400	45	37	34
250	36	31	29
150	32	26	24

In the smaller sizes, which will shortly be in production, the inherently lower efficiency (given the same design) will be largely counteracted by increasing the watts dissipated per unit length of the discharge column. In order to withstand the higher temperatures entailed by the higher pressures employed, the inner tube will be of quartz instead of hard glass, and this is to be anchored in a pearl frosted bulb of standard shape.

For floodlighting 150-W neon and 100-W mercury lamps have been introduced into the "Osira" range. These have luminous columns half the length of the longer tubes but with the same diameter, so that parabolic reflectors of the same curvatures and focal length can be used to produce similar light distributions. The new neon lamp has a tube efficiency of 10 lumens per W and an overall efficiency of 8.5 lumens per W. Corresponding figures for light-blue and light-green tubes are 12.5 and 9.5, for dark-blue tubes 5.5 and 4.25, and for dark green 9.5 and 7.25. Starting of the new lamps is by means of an auxiliary electrode system, and the Tesla coil of the higher-wattage lamps has been dispensed with.

Agreement has been reached between authorities at home

and abroad regarding the unit of light in terms of the various electric discharge lamps to an accuracy satisfactory for commercial purposes. Differences in colour of the discharge lamps and that of tungsten-filament lamps are minimised by colour filters placed between the tungsten lamps and the photometer head. The transmissions of the filters are calculated for their spectral transmissions, determined visually or photo-electrically, the spectral energy distribution of the tungsten source, and the internationally agreed luminosity data.

In this the integral transmission of the filters is calculated for light from their associated tungsten sources. The photometric balance is made on an equality-of-brightness photometer head, subtending an angle of 2 deg. at the eye, and operating at a field brightness of 2.5 equivalent ft.-candles. Under these conditions any observer can make a photometric balance without difficulty, and the errors which would be caused by the full colour difference are practically eliminated. However, because the approximate colour match so obtained is not an energy match, small differences will occur between the results obtained by different observers, so that for the most accurate work a group of observers is employed.

Developments in cold-cathode tubes continue to centre round the use of luminescent powders applied to the inside walls of the tubes. These coatings are excited by ultra-violet radiation from the discharge to give visible light of characteristic colour, giving not only new colours, but also in many cases considerably enhanced luminous efficiency. Gold and pink are now being used commercially; these differ from others obtained by the fluorescent method in the use of pure neon instead of mercury for exciting the luminescence. For interior lighting about six combinations of tubes, utilising pairs of red, green, blue, gold and pink colours, have been evolved to give resultant colours suitable for general illumination.

Standard 8ft. 6in. units dissipate from 100 to 200 W, giving overall luminous efficiencies of 16 to 20 L per W. The working voltage of the tubes varies from 800 to 1,200 V. Attention has also been directed to increasing the effective sensitivity of photo-electric cells by the use of secondary electron emission. The surfaces used as cathodes in cells of the calcium type are also excellent secondary emitters. Secondary emission has advantages over magnification by gas filling due to greater stability and freedom from time lag, and advantages over valve amplification due to compactness and greater freedom from irregular noise.

Electrical Development at Walthamstow

THE official opening of the new electricity offices and showrooms of the Walthamstow Borough Council electricity undertaking on Saturday last marks a step forward in the history of the undertaking. The supply was inaugurated in 1901 when the station had a rating of 225 kW; to-day the plant capacity is 20,500 kW, and the maximum load this winter

New showrooms and offices of the Walthamstow Electricity Department showing (top) the exterior and (right) a view of the commercial kitchen

(19,590 kW) has nearly equalled this capacity. On March 31st, 1903, the end of the first complete financial year, the kWh sold was 542,423 and the consumers connected totalled 505. For 1935-36 the figures were 48,578,128 kWh and 29,154 consumers, while the average price has fallen from 3.99d. per kWh in 1902-03 to 1.177d. per kWh in 1935-36. Hire and hire-purchase terms for cookers and other electrical apparatus are in operation together with a two-part tariff. Of the 30,000 domestic consumers now connected, 13,180 have adopted this rate. An assisted wiring scheme was introduced in 1923 and to-day there are over 17,000 of these installations.

At the official opening of the new premises Ald. W. H. Shaw, chairman of the Electricity Supply & Lighting Committee, paid a tribute to the work of Mr. G. R. Spurr (borough electrical engineer) who had built up the undertaking from its inception. The undertaking had been developed by personal contact with the consumer and he trusted that the new showrooms would lead to greater improvements.

Sir John R. Brooke, C.B. (vice-chairman of the Electricity Commission) said that the Electricity Department's figures of kWh sold, consumers connected and income received were well above the average for the country. In Walthamstow he noticed that 88 per cent. of the people were connected to the electricity supply, of which about 50 per cent. had adopted the two-part tariff

The new buildings have an area of approximately two acres and the offices and showroom block has a frontage to Church Hill of 182 ft. and a maximum depth of 153 ft. The entrance hall is panelled throughout and contains two counters for dealing with sales and inquiries and two large showcases for display purposes. An illuminated fountain is situated in front of a central staircase to the first floor. Leading off the hall to the right is a suite of rooms laid out as an all-electric flat and on the extreme left are the domestic appliance and fittings display rooms. The latter gives access to a demonstration room having a seating capacity for forty persons. The remainder of this floor is taken up by various offices.

The first floor is also laid out with offices for the staff, while the second floor consists of an assembly hall and a commercial kitchen. The latter with a scullery and larder is for demonstrating the advantages of large-scale electrical cooking. The assembly hall is illuminated by specially designed architectural lighting fittings suspended from an arched ceiling and with a platform at one end has a seating capacity for 337 people. Although primarily intended for cookery demonstrations and other electrical propaganda, the hall will be available for concerts and lectures, and, in conjunction with the electric kitchen, for dinners and like functions. On the same floor are rooms for the staff and the caretaker with accommodation for the telephone equipment.

The basement contains the heating plant, strong room, and operating gear for the lift which serves all floors. For heating the building and workshops separate thermal storage systems have been adopted. The installation for the offices and showrooms comprises a 3-phase medium pressure electrode boiler, operating in conjunction with a 3,250-gal. capacity storage cylinder and invisible panels embedded in the ceilings. For the workshops and stores buildings the heater is of the immersion type, also thermostatically controlled. The installation work was done by the Department.

Meetings and Discussions

The uses of electricity by the London Fire Brigade were described by Major C. C. B. Morris, the chief officer, at a meeting of the Institution of Mechanical Engineers last week. At the Institution of Electrical Engineers on January 21st several well-known switchgear engineers expressed their views on the questions raised by Mr. J. O. Knowles in his paper on motor control which was dealt with in our last issue. A number of aspects of lighting are being dealt with by experts in a series of lectures in connection with the Electric Illumination Exhibition at the Science Museum, South Kensington

Fire-fighting Equipment

THE organisation and mechanical appliances of the London Fire Brigade are described in a paper by Major C. C. B. Morris (chief officer, London Fire Brigade) which was read before the INSTITUTION OF MECHANICAL ENGINEERS in London on January 22nd.

The author explains how the automatic plumbing of steel turntable ladders is effected by an electric motor housed in the elevating frame. A switch attached to the under part of the main ladder contains two sealed glass tubes, out of parallel, containing mercury. When the ladder is out of plumb the mercury flows to the lower end of one of the tubes, thus making an electrical contact which sets the motor in operation. This in turn drives the plumbing screw. The semi-automatic arrangement prevents the ladder from constantly replumbing itself in windy weather. In this case the plumbing is operated by two push buttons, for right and left, respectively.

By means of two cams on the elevating frame the motor is automatically shut off on reaching an inclination of 75 deg. and also on reaching the resting position. A "field of operations" indicator shows at a glance the position of the ladder at any elevation. This indicator is electrically connected to the motor so that when the ladder reaches its safe maximum extension for any given elevation the gears are automatically disengaged. The indicator hand, by making contact with an aluminium plate, instantly actuates the electro-magnet controlling the clutches. The dial for the extension is provided at the back with a curved guide which actuates the control rods in such a manner that the higher speed for elevation and inclination can only be used up to an extension length of about 50 ft. When the ladder is extended beyond this length the control rods automatically reduce the speed from high to low. Loud speaking telephones are fitted to enable the controlling officer to communicate with the fireman at work at the top of the ladder.

Special emergency tenders are fitted with a dynamo and switchboard for providing light at fires where necessary. Floodlights giving wide and powerful beams of light are connected by cables. Four of these lights are on the machine, each provided with 300 ft. of cable. If necessary, one light can be used with 1,200 ft. of cable. For electrical fires the firemen are provided with special rubber boots and gauntlets tested to resist 20,000 V.

Motor Control and Protection

THE paper in which Mr. J. O. Knowles (Brookhirst Switchgear, Ltd.) makes practical suggestions regarding the layout and protective functions of motor-circuit controllers (to which reference was made last week) was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 21st. The author made use of short cinema films and experimental demonstrations to emphasise the difference between a.c. and d.c. circuit-breaking by contactors.

The discussion was opened by Mr. W. H. Clothier, who said he shared the author's desire to establish recognised limits to "blocks" of power under fault conditions. He suggested modifications of the author's proposed layouts for keeping bulk supplies under safe control. The advantages of 3,300-V motors were many from the current reduction point of view, but care would be needed to avoid placing fuses in confined spaces. High rupturing capacity fuses were extremely useful in industrial control gear, and some agreed method of testing them was needed in order that their rating might be standardised. He suggested a single-phase test in order to "catch" the worst condition of rising voltage just when the fuse was about to melt.

Mr. E. A. Reynolds thought the author had made out an extraordinarily good case for 3,300-V motors of 100 h.p. and over. For many years he had used 5,000-V transmission and high-voltage motors. When change of frequency came about the transmission voltage was changed to 11,000 V and subsequent experience had proved that the motors gave less trouble and involved lower maintenance costs than lower-voltage machines of the same size, apart from the extra transformation and larger capital outlay needed for the lower voltage. A.c. circuits would break themselves if allowed to do so without interference. Designers would have greater scope to obtain the necessary closing speed and pressure if switches of the short-break type were not mechanically restrained, but allowed to continue on into a long break.

Dr. W. Wilson said that he could not understand the complex which made people strive to use low voltage. He strongly endorsed all that had been said about the disadvantages of low voltage, which introduced serious difficulties into the design of switchgear of equivalent size. There was nothing to be gained by avoiding the safer higher voltages. The breaking capacities of 400-V gear should be limited, say, to the standstill current of the motor; if a fault materialised it should be cleared by some other device, not the controller. Plurality starting was simpler and cheaper when machines did not require to be frequently started; in ships one starter could be made common to twenty-five motors. Thermal trips had been stigmatised by the author, but Mr. Wilson said he had tested both kinds and found them equally reliable if made robust enough. The range of metals now available would enable one to choose a type for any conditions.

Mr. E. H. B. Martin considered it of the utmost importance that "control" gear should not "open" under short-circuit conditions, otherwise the result might be disastrous. It was fortunate that thermal relays were coming into use, for they provided a time delay which enabled any fault to be cleared by the switchgear, as it should be. Only by making a large number of tests could one be sure that the worst conditions had been reached.

Mr. L. Gosland pointed out that the use of the reaction of the cable leads between transformers and circuit-breakers to limit current would also cause voltage control to deteriorate. Both the high rupturing capacity cartridge fuse and rewirable type had their own particular spheres of usefulness.

Mr. D. J. A. Butcher wished for lines of demarcation to be drawn between circuit-breakers, fused switches and motor control gear. He was surprised that 12,500 kVA had been suggested as the limit, since cartridge fuses had been proved capable of dealing with larger values. When such fuses were used there was no need to include motor control gear in short-circuit considerations. He pointed out that thermal trips had been embedded in motor laminations or end turns, in preference to inclusion in the external circuit.

Mr. W. E. Highfield explained that what voltage could be impressed upon a motor was almost a mechanical consideration, depending upon the size and type of winding, insulation and support employed.

Mr. Knowles, in reply, drew attention to the danger of using two transformers to divide a circuit as a means of limiting short-circuit current. Control gear makers should not be asked to provide too great a rupturing capacity. It was difficult to deduce from single-phase test figures what would be the rupturing capacity of fuses in a three-phase circuit. Motors of the simpler types had been made for 3,300 V down to 50 h.p. in size. He had not wished to stigmatise thermal trips, but to emphasise the risks involved in not making certain that the right type and size was used.

Electricity in Fire Fighting
Motor Circuit Control
Aspects of Lighting

Lectures on Lighting.—The series of lectures arranged in connection with the Electric Illumination Exhibition at the Science Museum, South Kensington, included one by Dr. J. W. T. Walsh (National Physical Laboratory) on light and vision. He was followed by Mr. L. J. Davies (B.T.-H. Research laboratories) who dealt with luminescence and fluorescence, broadly meaning the production of light other than by incandescence.

It was pointed out that, although the efficiency of the modern electric discharge lamp was high, there was still a wastage of some radiated energy in the ultra-violet spectrum. The fluorescent powder would act as an atomic frequency changer, and produce useful visible energy from this invisible ultra-violet light. This meant that fluorescent powders were a means of improving both the colour and efficiency of discharge lamps. On February 1st Mr. Edward C. Lennox (of the North-Eastern Electric Supply Co., Ltd.) will emphasise the need for better street lighting and the necessity of so applying the illumination as to obtain the best results from the existing road surfaces. There will be a demonstration of actual street lighting fittings. On February 8th Mr. H. Lingard will lecture on floodlighting, with special reference to festive occasions, while on February 15th Mr. H. Robertson's subject will be light and architecture.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Electrical Engineers' Remuneration

If laymen were to scan the "Situations Vacant" columns in the ELECTRICAL REVIEW and other technical journals their impression of electrical engineering as a profession would be very poor indeed. The salaries and wages offered to skilled engineers are, in the majority of cases, hopelessly inadequate, and it must be very disheartening to men who have devoted their lives to the science of electricity to note the value placed upon their labour and studies.

Another thing that occurs to the writer, in connection with some of the ridiculous advertisements referred to, is the fact that, in the majority of cases, any man who has the misfortune of being over 45 years of age is not considered suitable. With all due deference to our numerous clever young electrical engineers, surely a man of 50 or over, who is in possession of good health, is active, and has devoted his whole life to the "science" is definitely superior, when brains, common sense and business acumen are called for.

Personally, I am of the opinion that many otherwise shrewd employers allow excellent opportunities to slip past them when applying for help by the proviso that the applicant must not exceed 40-45 years of age. ALEX. MILNE.

Glasgow, *January 22nd.*

The Future of the Tramways

Mr. L. C. Ford's letter in your issue of January 22nd appears to indicate that he is not well acquainted with the intricacies of road transport.

London Transport is worsening the already adverse conditions on London streets by scrapping the tramways, as a railless vehicle, which is guided by the human element, has a far greater tendency to mishaps than a vehicle such as the tram which is confined to a fixed route. With the present deterioration of the "human element" in control of motor cars and buses it is a pity that more road vehicles are not confined to a definite track.

As you pointed out in your leader columns, tramways are vanishing directly track renewal becomes essential, and not, as Mr. Ford puts it, in the interests of the public. Weather has a great influence on road traffic. Wet, greasy and ice-bound roads are synonymous with severe mishaps to rubber-tyred vehicles, but tramcars can carry on normally in such conditions. These facts are of *public* interest and not the financial position of the transport undertakings.

RUPERT A. PERKINS.

London, S.W.12, *January 23rd.*

Your leading article of January 22nd asks "Why Not the Trolley-bus?" There has been a lot of confused thinking on this subject, and those not conversant with transport are constantly writing to newspapers demanding trolley-buses on the ground that they run on power produced from British fuel. On the other hand, we find transport experts are as a rule silent on the question.

From the important point of view of keeping the electrical load as high as possible there is unfortunately a much-overlooked danger in the wholesale conversion of tramways to trolley-bus systems—the danger that the trolley-bus and its capabilities are being over-rated and is being given a place in transport which it cannot hold. In some cases its adoption is preventing the development of the essential advantages of the electric tramway system—advantages no other form of transport can hope to equal in the nature of things.

Why should this danger arise? I would try and sum it up as follows: (1) As a traffic unit the trolley-bus must be inferior to the self-propelled bus. Under service conditions, even if one vehicle be on a different route from that in front of it, it cannot pass it. In a steerable vehicle this disadvantage (which no amount of ingenuity can conclusively dispel) is very great and bound to cause congestion. Then to be sure, to some extent, that the trolley-heads do not leave the overhead wires the trolley-bus driver must run round corners and through some junctions at a very low speed. These and other points cause little difficulty in small towns or on quiet routes, but are bound to become eventually intolerable in congested areas.

(2) Should a form of power other than electricity render the self-propelled bus as cheap as or cheaper to run than the trolley-bus, the ugliness of the overhead equipment will spell the doom of the trolley-bus in many places. The present popularity of the latter is no criterion of its future.

The Light Railway and Transport League, in the formation of which I am assisting, though primarily intended to support tramways, more particularly in developed forms, will also advocate a place in transport for *every* type of vehicle. We cannot conceive that the trolley-bus will hold the prime place in surface transport, and consider there is every justification for the use of highly developed tramways in congested and very busy areas. The place of the trolley-bus we put as next on the list in view of its efficacy in the quieter areas where there is a good amount of traffic. In that place, and that place only, is the trolley-bus likely to assure for itself a future of any kind. Assumption on the part of authorities with lack of foresight that they can use it for *any* area, will inevitably be the ruin of that vehicle, with consequent disastrous effects on our great electrical industry. S. G. JACKMAN.

London, S.W.16, *January 23rd.*

A Salesman's Grievance

May I ask you to ventilate an old, but very real grievance from which engineers, and particularly sales engineers, are suffering, for even at the present time when work is supposed to be plentiful for all trained men in every branch of the engineering industry employment is hard to get?

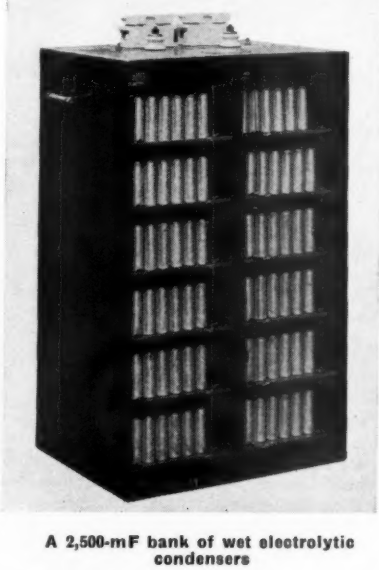
With the great influx in the past ten years or so to the selling business of every youth who fails to qualify for a definite profession or trade, or who is afraid of hard work, or owing to the unfortunate condition of affairs from 1922 onwards, has never had a chance to obtain remunerative employment and in consequence has been relying on State assistance (and by virtue of these "sops" has been able to get along quite nicely), things have become very difficult for the man from 35 to 50 who is *trained*.

Like "peasant farming," including the poultry section, salesmanship appears to offer great attractions, but in actual fact the position of salesmen is becoming intolerable. When we find even some of our larger concerns adopting "commission only" methods, and not even allowing car or bus fares, it is time that something was done to protect the interests of genuine sales engineers by the Institution of Electrical Engineers or other existing body as the E.C.A., E.D.A. or the B.E.A.M.A. P. NUTTER.

Newcastle-on-Tyne, *January 18th.*

Large Wet Condenser Installation

AMONG the batteries of surge-proof wet electrolytic condensers supplied during the past year by the Telegraph Condenser Co., Ltd., is the one illustrated herewith. This was for use in an electric tramway station. The condensers are mounted on removable racks in a steel tank; they have a total capacity of 2,500 mF and the battery is suitable for working at 600 V d.c. plus a superimposed ripple of 10 V a.c., 50 A, and is used for suppressing ripple on a d.c. line.



A 2,500-mF bank of wet electrolytic condensers

Technical Data on Fuel

The fourth edition of "Technical Data on Fuel," published only just over a year ago, is now exhausted, although the number printed was considerably larger than that of previous editions. The British National Committee of the World Power Conference states that the book has been adopted by fuel technicians in more than twenty countries, in addition to Great Britain and the United States. A second impression of the fourth edition equal in number to the first impression is to be printed, but a new fifth edition will probably not be published before 1939.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Refuelling Aeroplanes

In order to minimise the time taken in refuelling aeroplanes, Flying Training, Ltd., has put in service at the London Air Park, Hanworth, a four-wheel electric truck with specially designed petrol-storage tank and filling pump. The vehicle was built by ELECTRICARS, LTD., for North Sea Aerial and General Transport, Ltd., Brough, East Yorks.

It is claimed that the new truck has been the means of reducing the time formerly spent in refuelling at one fixed point by between 50 and 70 per cent. It comprises an Electricar chassis with platform at the rear, all instruments and controls being vertically disposed under the two-way petrol or oil pump switch, while on the right is a drum-type controller giving three forward speeds and reverse. On the extreme left side of the instrument panel is a tiller steering lever. The necessary power is supplied by a battery of Young accumulators. On top of the 200-gal. petrol tank is carried a small step-ladder by means of which access is gained to the top centreplane tanks, such as are fitted to most training airplanes. A further use for the truck is in towing machines to and from the hangars across the aerodrome.

Electricar truck for refuelling aeroplanes

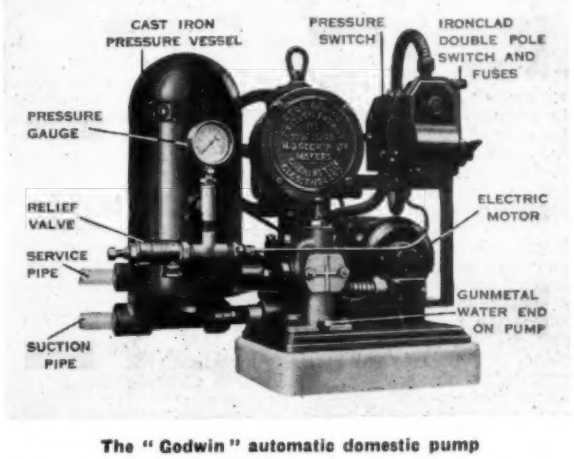
An Iron with Special Features

An electric iron sent to us by W. T. FRENCH & SON, LTD., "Mysto" Works, Browning Street, Ladywood, Birmingham, 16, has a slightly streamlined moulded handle which is in one piece with the connector, the cable entering the connector from the off side. At the back of the handle is a push switch (projecting about ¼ in.) of the pressure-contact type, and for this reason the iron should only be used on a.c. supplies. By pulling the knob and turning it to the left it can be locked in the "on" position, the iron being tilted on its back-rest until the required heat is obtained. When the iron is ready for use the knob is turned to the right and is free to move in and out. In this position the iron is automatically switched off when on the back-rest. When the iron is out of use the switch is locked in the "off" position by pushing the knob in and turning it to the left. The loading of the element is 500 W, and two yards of flex with a lampholder adaptor is provided.

The "Mysto" iron

Automatic Domestic Pump

An automatic pumping plant that is designed for domestic work has been introduced by H. S. GODWIN, LTD., Quenington, Glos. When no storage capacity is required this type A.1.E.D. provides a complete direct-water system in itself for pumping from wells not more than 22 ft. deep. In operation it is similar to the ordinary pressure system and a cast-iron air chamber provides a cushion. The plant is started up by the opening of a tap and stopped by closing it. The water end of the pump is of gunmetal. The complete equipment includes a pressure switch, double-pole switch and fuses, pressure gauge and safety valve, a repulsion-induction motor for single-phase supplies or a compound-wound motor for d.c. A similar plant is also available for pumping from deep wells.



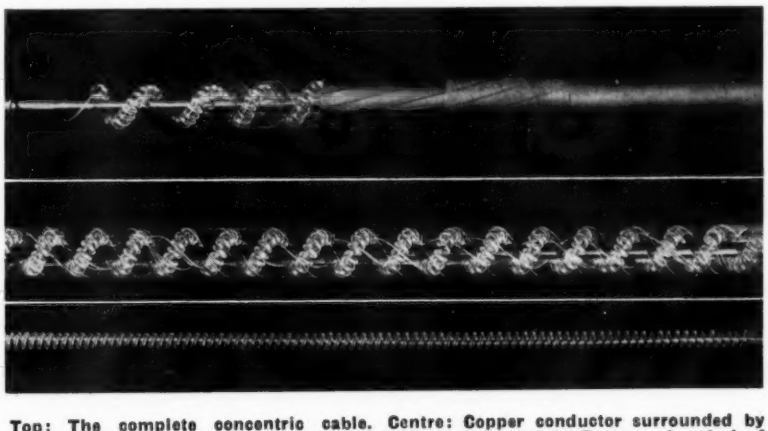
The "Godwin" automatic domestic pump

A Wind-driven Charger

GORDON EQUIPMENTS, LTD., 25, Milton Street, London, E.C.2, have been appointed distributors in this country for the "Wincharger," a wind driven battery charger with a maximum output of 15 to 20 A at 6 V. The propeller is 6 ft. long and drives an air-cooled dynamo with a front end commutator. An air brake governor of the centrifugal type is fitted, preventing overspeed and eliminating vibration and damage.

Insulating Material for H.f. Cables

The type of co-axial cable ordinarily employed for high-frequency work is costly as it makes use of single space rings of high-quality insulating material placed at regular intervals between the conductor and the covering. FELTEN & GUILLEAUME, Carlswerk A.-G., Köln-Mülheim, Germany, have made use of a new insulating material which has the same dielectric properties as "Calit" and similar materials, but which enables "broad band" cables to be made on ordinary machines, thus considerably lowering the cost. The new material is called "Styroflex" and is derived from trolitul, a hard substance. "Styroflex" is pliable, elastic and transparent, non-hygroscopic and its dielectric properties are considerably better than those of paper. Experiments have shown, the makers claim, that the symmetrical type of "Styroflex" "broad band" cable which was first used in Germany is only advantageous for frequencies under 30-50 kc. Modern television requires 200 or more kc. For these bands a concentric cable containing only one main conductor, as shown in the accompanying photograph, was found to be best. The figures



Top: The complete concentric cable. Centre: Copper conductor surrounded by "Styroflex" and covered with a band of the same material. Bottom: A spiral of "Styroflex"

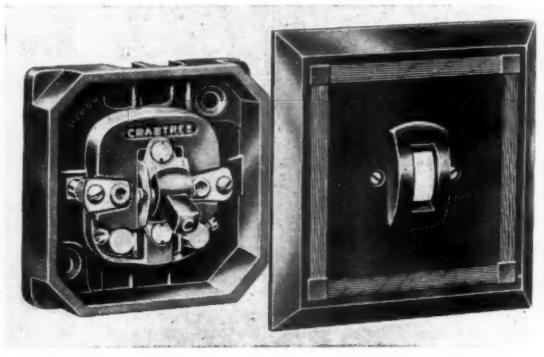
issued by Felten & Guilleaume are as follows: Symmetrical type (two parallel "Styroflex" insulated conductors), outer diameter 25.5 mm., "damping" factor 0.19 Neper per km.; concentric (co-axial) type, exterior diameter 19 mm., "damping" factor 0.16 Neper per km. These figures apply to a frequency of one million cycles.

A "Lincoln" Flush Switch

The "Lincoln" flush switch of J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall, is an adaptation of the "Lincoln" surface and ceiling switch to flush requirements. The terminals, however, are for front wiring, a feature which is new to Crabtree flush switch practice. The chief innovations are in the "Jacelite" box, which has adjustable pillars to enable the switch to be aligned with variations in the plaster level, and several fixing hole arrangements. Generous space is allowed and substantial cover for the plaster joint is given by the wide plate overlap.

Cutting away of the brickwork is unnecessary in installing the switch because four corner projections "key" the box below the plaster and screw fixing can be made through any of the three countersunk holes. "Knock-outs" are provided at the top and bottom for incoming cables, there being ample space for slack inside the box.

As an alternative to the "Jacelite" box, where price is a vital consideration, an extra shallow hardwood box can be obtained. The switch, which is available in one-way, two-way and one-way "loop-in" terminal patterns, is suitable for use on a.c. or d.c. supply, and is fitted with the rugged "Lincoln" dolly. For these particularly shallow assemblies, the switch is offered with front wiring terminals only. These are designed to accommodate up to four 1/.044 or two 3/.029 cables, and are, therefore, quite suitable where extensive "looping" is contemplated. The fixing ears also permit the switch to be turned slightly out of centre in erection—a small point of great importance when the box has not been set "dead square." The plate is strong and rugged and will stand up to much mishandling. It is not possible to crack or fracture it by excessive tightening of the fixing screws; neither is it possible to fix it so that it will impair the swivel action. The switch is available in white or brown bakelite.



The new "Lincoln" flush switch

Fractional Horse-power Motors

A NEW range of d.c. and single-phase a.c. fractional horse-power motors has been designed by HIGGS MOTORS, LTD., Witton, Birmingham. These machines are constructed with an air space between the external shell and the stampings to permit cooling by air circulation, giving greater output for given dimensions. They can be supplied with round yokes for cradle mounting or with feet forming part of the yoke for horizontal mounting, thus obviating liability to distortion of one end in relation to the other. Interchangeable plain-bearing and ball-bearing types are available.

In general design the new machines are similar to the larger industrial motors with windings of former wound coils and with coil ends well insulated from the core. The louvred end covers are spigoted to the shell, the whole assembly being drip-proof. The bearing housing allows the plain-bearing machine to be mounted in any position, provided the shaft is in the horizontal plane. Standard ball-bearing machines can be mounted in any position, including the vertical-shaft. Above the bearing housing, the terminal is out of the way of surplus oil.

On d.c. machines two sliding-box brush holders (four per motor) with a double-width commutator are fitted. The brushes are connected by leads so that the springs are not used as conductors. One brush per spindle would carry the current, but the two obviate trouble due to vibration, as in compressor or pump drives.

On the repulsion-start single-phase type, the centrifugal short-circuiting gear is a miniature copy of that employed for larger motors up to 5 h.p. of the same company's make.

Other points are: Shafts of 35- to 40-ton tensile-strength steel, screwed conduit entry to terminal boxes, and a journal diameter larger than shaft extensions facilitating bearing replacement and dynamic balancing of rotors and armatures. The torque exerted by the different types of motor when started by being switched directly on to the line at rated voltage and frequency, compared with full-load figures, are as follows, the lower figures being those for the smaller sizes: split-phase, 1 to 1¾ times; repulsion start, 3 to 5 times; d.c. 5 times. An innovation in this field is the introduction of a compact single-reduction gear as an integral part. The driving pinion is of high-carbon steel and the driven pinion of special composition. The two gear wheels are enclosed in a dust-tight casing and grease lubrication is employed.

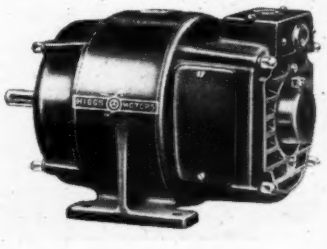
A new type of fractional-h.p. single-phase capacitor-start induction motor is made by LAURENCE, SCOTT & ELECTROMOTORS, LTD., Gothic Works, Norwich, and incorporates certain distinguishing features. The most important of these is the use of a current-operated, in place of a speed-operated, relay to switch the condenser out of circuit when the motor has run up to speed.

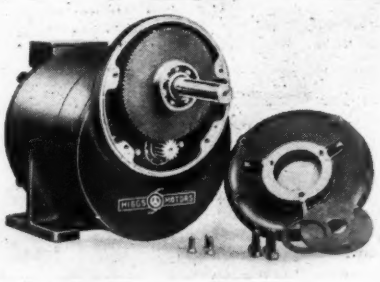
Two advantages are claimed for this innovation. First, it has only one moving part and can be mounted where there is sufficient room for sound mechanical design, whereas the centrifugally operated switch has a large number of parts in a confined space. Secondly, it always operates at the same correct load and torque, and is independent of the heating of the rotor.

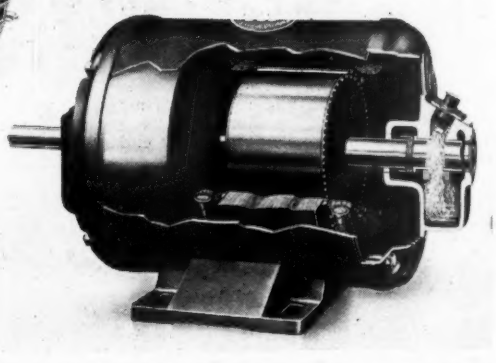
The relay contactor is housed within an enclosure which is an integral part of the end shield and so is easily accessible for inspection. Its large tungsten contacts are capable of giving as long service as the motor itself. The self-sealing condenser is mounted inside the motor frame, where it is well cooled and protected from risk of damage, thus avoiding any increase in the height of the machine—a feature of some importance, since motors of this type are often required for situations where the space available will not accommodate a motor which has a condenser fitted on top.

The sleeve bearings have a length twice that of the shaft diameter and are diamond bored, giving an accuracy of one ten-thousandth of an inch and a finish equivalent to that resulting from long running-in. In consequence, without reducing the length of time the machine will operate without attention, the size of the oil well and the volume of oil provided can be kept to the minimum, thereby obviating risk of oil reaching the motor windings. The terminal boxes are provided with reversing links, detachable covers bearing wiring diagrams and bushes and are screwed for conduit.

The frames of the motors are of the rigid L.S.E. steel-frame construction. A high standard of silence, which is important in fractional horse-power machines extensively used for domestic purposes, is secured by large air gaps, close tolerances, dynamic balancing, and the absence of large fans. Plated headed nuts and name plates have been adopted to enhance the appearance.







Top left: A complete Higgs d.c. motor. Top right: A similar motor in parts. Bottom: L.S.E. capacitor motor

The Electrical Situation in Australia

A remarkable recovery

A FURTHER improvement in general conditions in Australia during the past year is noted by Mr. R. W. Dalton, C.M.G., H.M. Senior Trade Commissioner in Australia, in his report to the D.O.T. on economic and commercial conditions in the Commonwealth (Stationery Office, 3s. net).

Reviewing the manufacturing industries, Mr. Dalton states that the progress in the last few years has been remarkable, and has been achieved not merely as a result of extraneous aids, but is also the result of a fixed determination to take full advantage of the opportunity afforded by economic conditions in recent years to make existing industries more efficient and to branch out in new directions.

In previous reports it has been pointed out that the supply of many goods, formerly imported, has now been diverted to Australian services. This has become even more obvious in the last two years and added to it now is clear evidence of the possibility that Australian manufacturers, in some classes of goods at least, have become, or are likely to become, more or less permanent competitors of the United Kingdom in other markets near at hand.

There has recently been a good deal of discussion regarding the possibility of attracting United Kingdom capital to Australia for the further development of secondary industries, and realising that there was need for some extraneous assistance to industries in the direction of the dissemination of greater technical and scientific knowledge, the Federal Government in July, 1936, announced that the activities of the Council for Scientific and Industrial Research had been extended to embrace investigation of the problems of secondary industry. The Council has appointed a standing committee, including representatives of the Australian Standards Association, Chambers of Manufacturers, engineering associations, and the Australian Association of British Manufacturers, the first duty of which will be to make a survey of the work and organisation of the more important engineering and physical research institutions abroad, but which will later investigate the problems of all branches of Australian secondary production.

Local Manufacture

A continued improvement in the local manufacturing industries is reported. The number of factories in 1934-35 was 24,211, employing 449,598 hands, as compared with 23,297 and 405,909 respectively in the preceding year. The total value of output was £364,912,421, which is only slightly lower than that for 1928-29, the peak year, when the figure was £420,445,288. It is certain that the figures for 1935-36 when they become available will show a still further increase in the activities of manufacturing industries generally. From an electrical point of view the value of the output in 1934-35 of electrical installations, cable and apparatus was £3,822,000, and of wireless apparatus £1,859,000.

In an analysis of the import trade Mr. Dalton's report contains a section dealing with machines and machinery, including electrical apparatus. He states that the whole of this class is competitive in character and the total imports, though still a long way below the figure of £14,739,503 for 1928-29, showed a welcome increase from £4,264,733 in 1933-34 to £6,567,671 in 1934-35, and £9,522,513 in 1935-36. The share of the United Kingdom in 1934-35 was £3,598,528, or 55 per cent. of the total, which compares with 56 per cent. in 1933-34 and 51 per cent. in 1932-33. At the same time the share of the United States increased from 26 per cent. in 1933-34 to 29¼ per cent. in 1934-35.

Although the United Kingdom has in the past few years considerably improved her position with regard to many types of machinery formerly regarded as foreign specialities, there are still many items in which she secures only a small share of the trade. The following table gives details of the imports in 1934-35 of those items in which competition with the United Kingdom was most noticeable :—

	Total Imports.	Total from U.K.
	£	£
Dry cells	3,114	1,233
Storage batteries for motor vehicles	6,055	1,515
Telegraph and telephone cable (p.i.l.c.)	11,366	5,477
Carbon manufactures	54,833	20,967
Electric motors under 1 h.p.	48,551	22,962
Ignition coils	16,407	3,889
Convertors, motor and rotary	2,694	821
Electric fans	12,879	4,032
Lightning arrestors, other than wireless	3,453	—
Relays of various types	4,455	2,084
Switches, fuses, cut-outs, etc.	60,870	29,389
Electric stoves, ranges, grillers, boiling plates, etc.	14,362	5,602
Household electric dish-washing and ironing machines	1,234	31
Automobile lamps	62,508	18,073
Filament lamps under 20 V.	25,036	10,771
Static transformers (66,000 V.)	2,393	951
Radio valves	327,390	117,026
Radio receivers	6,452	1,121
Battery eliminators	4,595	409
Radio parts	68,637	24,907
Insulating tubes	4,726	1,599

The manufacture of certain classes of machinery and electrical goods by Australian firms has developed in recent years to a point at which imports from the United Kingdom (and other countries) are now only a fraction of their total a few years ago, and the following statement indicates the principal types of machinery and other equipment affected by this development :—

	Imports from U.K. 1928-9.	1934-5.
	£	£
Dynamo-electric machines	512,536	256,307
Electrical fittings	329,582	29,389
Filament lamps	296,396	127,714
Regulating and starting apparatus	182,451	86,272
Static transformers	102,403	17,959

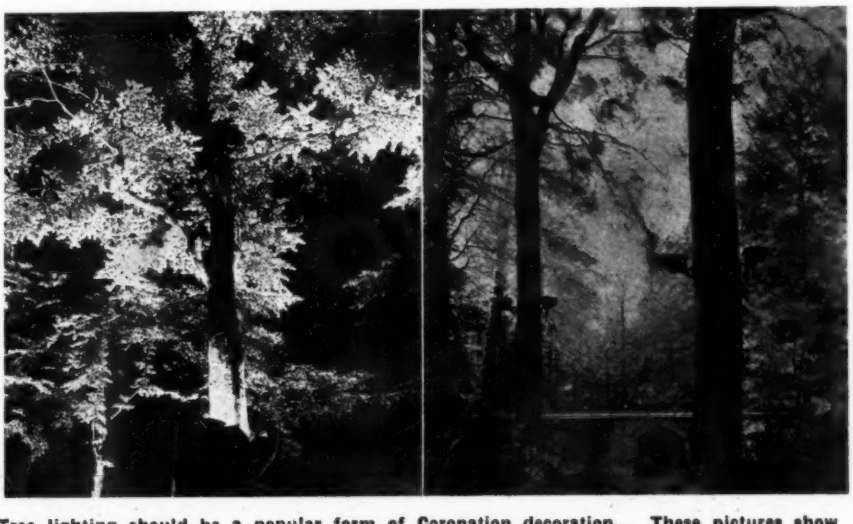
The most noteworthy development in the posts and telegraphs services in the past year was the opening in March, 1936, of direct telephone communication between the Mainland and Tasmania. The cable across the Bass Strait (manufactured and laid by a United Kingdom company) is the longest submarine telephone cable in the world (161 nautical miles). It provides, by means of the carrier-wave system, for simultaneous operation of telephone, telegraph and broadcast services.

New Broadcasting Stations

With regard to radio development, the work of installing regional broadcasting stations has continued, two such stations being opened at the end of 1935, while five more were nearing completion at the date of Mr. Dalton's report (October, 1936).

There are now sixteen national stations under the control of the Australian Broadcasting Commission in operation, while the number of commercial stations depending on advertising revenue for their income is nearly seventy. Plans have been drawn up for the replacement of the two existing national transmitters in Melbourne by two new high-powered stations on a site farther from the city than the two present sites.

New regulations were gazetted by the Commonwealth Government in November, 1935, providing for a maximum of eight commercial stations which may be owned or controlled in Australia by one person or company, and also dealing with the limitation of indirect control of these stations. The number of broadcast listeners' licences in force at June 30th, 1936, was 823,613, being 103,000 more than at the corresponding date in 1935.



Tree lighting should be a popular form of Coronation decoration. These pictures show the excellent results obtained and the method of mounting the projectors which in this case are Philips equipment

Maintenance Work. By "Works Engineer"

Training to be a plant engineer

MOST large factories now have a plant engineer whose many duties include the satisfactory running of the plant and the ordering of plant for future requirements. Under his supervision is an installation and repair department which has to test new machinery and install it, repair telephones and motors, grease line shafts and bearings and generally keep the plant running. Every minute lost to production puts up the cost of the finished article, and repairs can now no longer be put off till week ends, but must be done immediately.

The Apprenticeship Period

Some large firms place their apprentices on the maintenance staff for periods of from six months to one year to give them an insight into general engineering before they place them in the fitting shop, machine shop or tool room. This is only possible with large engineering firms, but in factories such as cotton and jute mills, the fitting shop and machine shop are part of the plant engineer's domain.

The practice of giving youths this experience of general engineering work has much to commend it, as they here learn how to use their tools without doing much harm to themselves or to the company's materials. The only drawback to this scheme, in an engineering works, is that the personnel under the plant engineer changes continuously and a bright apprentice who can be relied on to do what he is told, without undue supervision, is soon transferred to another department.

A maintenance staff should preferably have a number of capable men assisted by apprentices who are not being constantly changed. The work done in this department is such that a youth who serves his whole apprenticeship in it will, at the end of his apprenticeship, find himself able to do similar work elsewhere. If there is a drawing office attached to the works it is beneficial to allow him to spend at least a year there. In this way he will be able to familiarise himself with drawing office routine and the special requirements of the factory in which he is employed. After his spell in the drawing office room can usually be found for him on the plant staff, again as a journeyman. This is only applicable to those who show definite promise and who will appreciate what is done for them.

The time to be spent on this apprenticeship should be four years, split up as follows: Eighteen months on machine work, including turning, shaping, planing, drilling and the care of belting and shafting; one year on maintenance of cranes, boilers, steam and water-pipe fitting; and, finally, eighteen months on electrical work, lining up motors, wiring control gear, installation of works telephones, armature and stator winding, and power and lighting wiring. At the end of this period, if the youth is not chosen for the drawing office he can be retained in the workshops as an improver who will be able to do his work without constant supervision.

Works training should be supplemented by a night-school course of three years in mechanical engineering up to the lower national certificate standard, to include mathematics, elementary theory of machines and strength of materials and elementary drawing. The last is essential if the apprentice does not go into the drawing office, as the plant engineer often requires simple sketches of his layouts for submission to higher authorities who pass the plants, and these sketches must be clear.

Some Qualifications

A pleasant manner and ability to lead in discussions with the management relating to his work do much to ensure the easy passing of the plant engineer's programme, but he must be quick to point out any flaws in ideas presented him (else he may find himself burdened with some wildly impracticable scheme), and in a manner which will cause no friction between the works and executive staff. He must also keep himself abreast of all modern tendencies in engineering which will save the company time and money, and be quick to point them out to the heads of the manufacturing departments. When he finally attains the position of plant engineer he need not be able to perform personally all the tasks that have to be done in his department, but he should be able to determine whether or not each job is done in a satisfactory manner and within reasonable time.

The position of plant engineer can be reached only after a number of years of training and working in a subordinate capacity. Prior to putting himself forward for a plant job the candidate should acquaint himself with plant costs, estimating and other features of management.

Taken all round, the work of the present day plant engineer is more complex than that of his predecessor and the simple outline of training given above is necessary if the factory is to carry on with the minimum of delay. The whole works depend on him and his ability to make quick, accurate decisions in times of emergency. This ability may be worth pounds to his employers and is only gained after years of experience and a thorough knowledge of the best modern practice.

Training Electrical Salesmen

THE sale of electricity and electrical appliances is not the kind of work which can be left to anybody, although the industry has often been accused of ignoring this fact. The salesman is a more vital link between supplier and consumer in this than in almost any other industry and it is essential that he shall be a suitable and qualified man.

The British Electrical Development Association has been doing its best for some years to impress this upon the industry and its latest move is a course of training in domestic electrical salesmanship for men and women. As a result of an exhaustive survey throughout the country a correspondence course spread over six months has been formulated by experts. This is of an entirely practical nature and its aims are to improve sales procedure and selling efficiency by methods which will raise the status of the electrical salesman and increase his effectiveness to both his employer and the consumer.

The prior investigation disclosed an inability to appreciate fully the consumer's point of view. Accordingly the scheme concentrates particularly upon remedying that weakness. The course will point ways of finding out the customer's needs; guiding interviews with consumers; advising consumers how to use appliances; explaining the special merits of electricity; handling the question of competitive services; closing sales; and extending interest to the purchase of additional appliances.

The basis of the course of training is a series of six handbooks which will be issued to trainees at monthly intervals. In each there will be a test paper which will be completed and sent to London for marking. Students who complete the monthly examination papers will be given the opportunity of sitting for a written final examination. If in this they succeed in obtaining over 60 per cent. of the maximum marks they will be awarded a salesmanship certificate; for over 85 per cent. there will be a certificate of distinction.

It is realised that the examination will, by force of circumstances, merely indicate the candidates' theoretical knowledge of salesmanship and, while of much value, needs to be supplemented. Consequently it is proposed later to institute a diploma (to be granted to men and women with at least two years' experience) as evidence of practical ability.

A feature of the training will be the holding of discussion group meetings where possible in which the questions raised by the handbooks can be talked over and experiences and difficulties can be discussed. Special group meeting guides will be available for the assistance of group leaders who will be chosen by the trainees from among their own number. It is recommended that a two-hour meeting should be held monthly during the period of the course and the ideal number for a group is considered to be between twelve and fifteen. Smaller or larger groups are not ruled out, however.

The Association considers that the scheme will serve a patent need and achieve the desired results in the minimum time and applicants are asked to notify the responsible heads of their companies immediately of their intention to take the course. The actual details of the working of the scheme will be placed in their hands at a very early date. It should be emphasised that the scheme is open to all salesmen and saleswomen in the industry, whether their employers are members of E.D.A. or not.

Measuring Smoke Particles

An instrument devised by Mr. S. Blacktin for obtaining a countable record of dust and particles is described in the *Journal of Industrial Hygiene and Toxology*. The "Electrotor" meter consists of a pump plunger moved by a hollow rod through which passes, with liberal clearance, an archimedean screw which is meshed vertically through the centre of the free face of the plunger. When the plunger rod is moved longitudinally the archimedean screw turns round (the direction depending upon the direction of movement of the plunger) and rotates a record disc of celluloid or ebonite secured to it. The disc becomes electrified by friction simultaneously with the setting in motion of a stream of air or gas by the pump action and dispersed particles of dust are subjected to centrifugal force. It is claimed that the instrument is capable of rapidly providing records of particle contents of more than one million per cubic cm.

The Contractors' Dinner

Mr. Drake puts forward some proposals

AS is usual on such occasions, there was a large and representative gathering at the annual dinner of the Electrical Contractors' Association and its allied organisations at the Savoy Hotel, London, W.C.2, on Tuesday evening last. The chair was taken by the President of the Association, Mr. H. M. Drake, B.A., who was supported by several past-presidents and a number of distinguished guests.

After the King's health had been drunk, Lord Eltisley, President of E.D.A., proposed the toast of "The Allied Associations and Honorary Officials." He said that the E.C.A. was fortunate in having Mr. Drake as its president, and contractors were also honoured by having one of their number, Mr. H. T. Young, in the premier British electrical position—the presidency of the Institution of Electrical Engineers.

In these days with no clear line of demarcation between public and private activities, and when unwarranted legislative interference with industry was growing, it was only by co-operation that strength and efficiency could be assured. The Fair Trading Policy had won a certain measure of success, but there still remained fresh fields to conquer. The labourer was worthy of his hire; no section of the community was of greater importance than that which went into business and operated it at a profit. As taxpayers they were an indispensable part of the community. Municipalities who traded at the expense of their ratepayers should remember this and refrain from injuring the businesses of those ratepayers who sometimes carried on with the utmost difficulty. The Ministry of Health was endeavouring to secure an A1 nation; in helping to provide labour-saving and healthy homes the contractors were playing a considerable part in the realisation of this aim. He asked that the State should mind its business and that the citizens should be allowed to mind theirs.

A Co-operative Scheme

In the course of his response to the toast, Mr. Drake said that while the Fair Trading Policy, which had resulted from ten years' work, was supported by manufacturers, wholesalers, contractors and retailers, the supply industry remained aloof, although as large buyers supply undertakings were catered for in the Policy. They could not expect better treatment than this, and if this were not the stumbling block what was behind their unwillingness to subscribe to the Policy? Until fair trading principles became universal progress would be unnecessarily slow and the public would not receive the service which was its due.

The speaker then put forward the outline of a scheme for dealing with this problem. He suggested the formation of a committee consisting of an equal number of members of the E.C.A. and E.D.A. with an independent chairman. The E.C.A. would become responsible nationally for all canvassing of existing and prospective consumers. Its members would retail all current-consuming devices, instituting hire or hire-purchase schemes where necessary, and would undertake the service work in connection with these appliances and, of course, all the installation work. The supply authority in each district would have a complete list of recognised contractors which would be given to consumers and prospective consumers. The lists would be approved and periodically reviewed by the joint committee. The authorities would also give full information concerning their mains to the contractors and would encourage contractors' showrooms by preferential rates for electricity.

This scheme would ensure adherence to the principle of the Fair Trading Policy and it would greatly assist matters if the following points could also be eventually introduced: Compulsory registration of contractors and operatives; a minimum agreed code of wiring rules, enforced by the Electricity Commissioners; and the protection of the public against the use of faulty appliances. The proposed scheme would leave the supply authorities free to concentrate upon the standardisation and cheapening of electricity; they would do no contracting or sales themselves, to avoid overlapping.

The Association's Claim

Mr. Drake claimed that the E.C.A. was prepared to operate the scheme in practically all districts. Where there were no contractors capable of carrying out work under the scheme, men who were capable would be encouraged to open branches. The plan was not revolutionary; it was based on what had already been done in certain areas with complete success. He gave as an example the arrangement made in the area of the Metropolitan Electric Supply Co.—an example which was being followed by the Notting Hill Co.

Another desirable feature of the scheme would be the possibility of co-ordinating publicity to make it more effective. He claimed that the scheme was workable and would be beneficial to the industry and the public and he appealed for the application of the best brains in the industry to the matter to bring about a great advance in this Coronation year.

Mr. H. Willoughby-Ellis (past-president), in proposing the health of the guests, said that the presence of so many distinguished men was an indication of the national standing accorded to the Association. In an amusing passage he claimed that electrical contractors were notorious for their service to the public and their resultant poverty. He referred to Lord Eltisley's useful work in agricultural affairs, and aroused laughter by reminding the company that he was a director of Edmundson's Electricity Corporation which successfully combined the supply of electricity with electrical contracting. He expressed regret at Lord Hirst's inability to attend and respond to the toast as arranged. Lord Hirst was perhaps responsible more than any other individual for the success of British electrical engineering, particularly in overseas markets. He welcomed Mr. Young, as one of themselves, with particular satisfaction, and he also made appreciative references to Mr. F. Forrest, President, I.M.E.A., Sir Felix Pole, Sir Charles Bressey, Sir John Brooke, Sir Archibald Page and Mr. F. W. Leggett.

Contractors and the Institution

The first response was made by Mr. H. T. Young, who gave some reminiscences of his early days as chairman of the E.C.A. London Branch. He paid a tribute to those members of the E.C.A. Council who had done much good work for the Institution, saying that Mr. W. Rawlings had served on the Wiring Rules Committee for thirty years, Mr. H. J. Cash for twenty, and Mr. H. Marryat for eight. No doubt, he said, simplification of the Rules was possible, but he hoped that they would always remain as a model for the industry. He had discussed compulsory registration with many people, including representatives of countries in which it was supposed to be working, but he doubted whether it could be operated here for some time yet. The possibilities of voluntary registration had not yet been exhausted. The building industry had set a good example in this matter; its scheme of voluntary registration had secured the recognition of the Ministry of Health. He felt sure that the Ministry would be quite as willing to recognise an electrical registration scheme for it was anxious to secure good work in municipal housing estates. The Ministry of Transport should also lend its support to such a scheme.

Mr. F. Forrest said that the supply authorities, like the contractors, buried much of their work—that was why they were called "undertakers." The electricity supply industry had learned that it was necessary to sell their product, and they were going out for the business. Mere novelty was not enough; persistent propaganda, which had a permanent value, was essential. He claimed that as a rule the prices for electricity were reasonable and the two-part tariff was generally acceptable. With improved salesmanship contractors and supply authorities could go forward with confidence.

Sir Felix Pole, who also replied, said that as a thorough believer in the sound organisation of industry he would have liked Mr. Drake's scheme to include manufacturers. He was tired of persuasion and thought that the E.C.A. should go boldly to Parliament for a charter which would enable it to insist on good workmanship.

The chairman's health was proposed by Mr. J. G. Briggs, and Mr. Drake briefly responded.

Telegraph Material

The new B.S.S. for telegraph material (No. 16, 1937) just published is a revision of part of the interim report published in 1905. It deals with insulators, poles, fittings, &c. The specifications for insulators and for the gauges for insulator and spindle threads appears in the present edition for the first time, though the standards laid down have been in use for some time. The original specifications and tables relating to conductors and wires were superseded some years ago by specifications Nos. 174-181 and 182-184. An attempt has been made as far as possible, without penalising the home user, to meet overseas requirements. Copies of the specification may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 3s. 9d. post free.

Public Address Equipment

The issue of the *Wireless World* for February 5th will be primarily devoted to the subject of public address equipment and applications. Recent developments in apparatus will be described and special articles will deal with various aspects of this subject, which is growing in importance so rapidly. There are to-day public address equipments ranging from those for domestic requirements to the extensive outfits used in connection with addressing large outdoor audiences.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The British Industries Fair

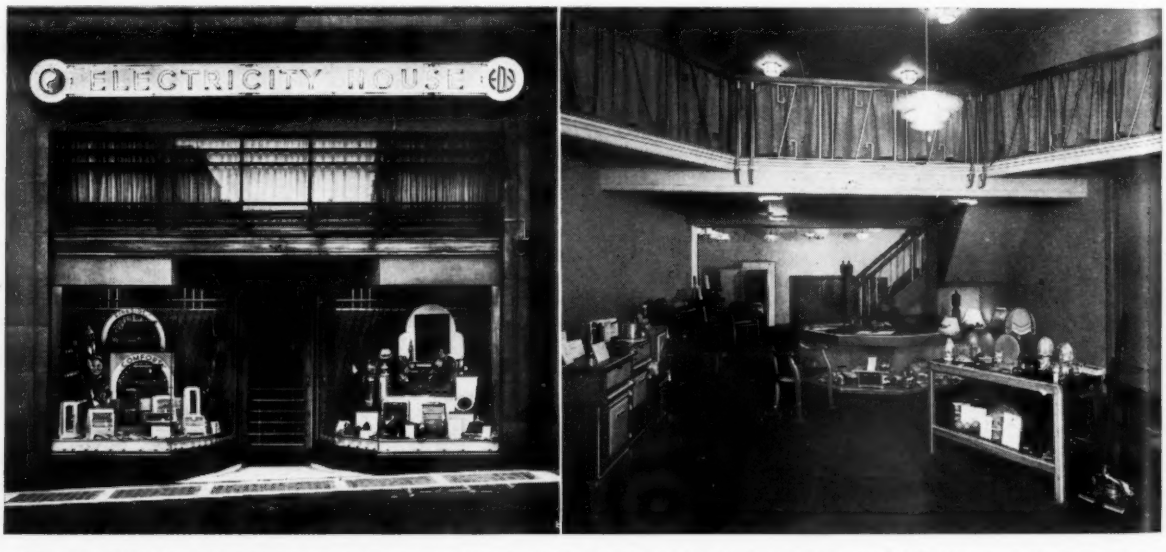
The names of the speakers at some of the electrical functions arranged during the run of the Birmingham Section of the Fair have been announced. At the luncheon on February 16th the principal speaker will be Mr. H. G. Williams, M.P., executive director of the Incorporated Association of Electric Power Companies. On February 20th, at the E.P.E.A. and E.A.W. luncheon, Mr. Frank Forrest, president, I.M.E.A., will speak, and on February 23rd Mr. H. M. Drake, president, E.C.A., will be the principal speaker.

A Large Transformer for Australia

One of the largest transformers ever exported to Australia was shipped to Melbourne on January 12th. It is a 28,000-kVA Hackbridge 3-phase unit to step-up from 11 kV to 132 kV, built for service at the Yallourn power station of the State Electricity Commission of Victoria. This unit, which, complete with coolers and auxiliary equipment, weighs over forty tons, was shipped sealed and filled with dry air under pressure. When the transformer is in operation cooling will be provided by forced oil circulation through a water cooler of special design. Another interesting feature of the transformer is that the windings are insulated throughout to withstand full-line voltage between turns—a special protection against surges.

New Showrooms at Huddersfield

New electricity showrooms have recently been opened in High Street, Huddersfield, by Electricity House, Ltd., an associated company of Electrical Distribution of Yorkshire, Ltd. The premises, which have a frontage of 21 ft. and a floor area of 2,000 sq. ft., are in a prominent position in one of Huddersfield's main streets. The decoration scheme is the attractive cream and pale green which is being employed in all the shops of the company. Situated in the basement is a kitchen where cooking demonstrations are held each week, and the display includes cookers, refrigerators, washing machines, wash-boilers and smaller domestic appliances. In the centre of the back of the platform is a panel with controls for cooker, wash-boiler, water-heater, kettle, &c. These appliances can be demonstrated with a minimum amount of movement on the part of the demonstrator. Red lights indicate which appliances are switched on and the panel eliminates untidy wiring. Surmounting the panel is an electric clock and a "unit" indicator; the latter showing the audience exactly how much electricity is being used. It is the company's intention to hold frequent demonstrations of washing by electricity in addition to the weekly cooking demonstration,



The new Huddersfield showrooms of Electricity House, Ltd., showing (right) the exterior, and left the general showroom

An Exhibition of Lighting Fittings

There is now being held in Manchester under the auspices of the Design and Industries Association an exhibition of electric lighting fittings and appliances in the Manchester Corporation showrooms in St. Ann Street. Exhibits cover a wide range of electrical fittings and domestic appliances such as irons, toasters, grillers, fires, etc. Each item exhibited has been specially chosen by a selection committee of the Association on the ground that it not only adequately serves its function but is, in itself, artistic and is æsthetically correct for the purpose for which it was intended. The exhibition was opened by the Lord Mayor of Manchester on January 25th.

South African Tenders

H.M. Senior Trade Commissioner in South Africa reports that Notice No. 1597, published in the South African Government Gazette of October 23rd, contains the newly approved regulations governing the constitution and operation of the Union Tender and Supplies Board and that these regulations involve certain changes in the procedure previously adopted in the issue of calls for tenders for Government supplies. The effect of the changes so far as United Kingdom firms are concerned, is that tenders will now be called for in the Union only and Union officials in the United Kingdom will cease to advertise such calls in this country; tender documents will now be available at the office of the High Commissioner in London for the Union of South Africa for inspection purposes only, and copies will not be provided as before; calls for tenders will be advertised in the South African Government *Gazette* and firms within the Union will not be advised of such calls direct, but must assume responsibility for ascertaining the details of all inquiries themselves and of applying for copies of tender documents. The effect will be that it will be almost essential for United Kingdom firms desirous of procuring details of calls for tenders issued by the Board to be represented in the Union.

Assisted Wiring at Torquay

At a recent meeting of the Torquay Corporation Electricity Committee a letter was received from Electrical Facilities, Ltd., stating that a number of contractors in the Corporation's area of supply had approached it with regard to an assisted wiring scheme, and the company forwarded particulars of the scheme which it would be prepared to introduce. The Committee decided that the company should be given the opportunity of inaugurating such a scheme. If the contractors put an assisted wiring scheme into operation within three months it would review the position at the end of the first twelve months' working. Subsequently, the engineer read correspondence between him and the local branch of the Electrical Contractors' Association. Three representatives of the electrical contractors were interviewed by the Committee, and were asked whether, in accordance with the previous information given, they were now prepared to go forward with a scheme of assisted wiring to be conducted by the contractors. Mr. Vanstone and Mr. Thomas, on behalf of the members of the Electrical Contractors' Association, stated that their members were prepared to inaugurate a scheme of assisted wiring in co-operation with Electrical Facilities, Ltd. This would embrace twenty-seven members of the Association throughout the Corporation's area of supply. Mr. Rider, on behalf of those contractors who are not members of the Association, stated that they were prepared to negotiate a similar scheme. In this case ten contractors will be concerned. The Committee decided that no objection should be raised to the contractors proceeding with the scheme outlined.

French Import Quotas

The *Board of Trade Journal* for January 7th contains a list of industrial products for which import quotas have been fixed by the French Government during the period January 1st to March 31st. The electrical material in this list includes electric lamps, dynamo-electric machines, transformers, electrical measuring instruments, heating apparatus, vacuum cleaners, insulating tubes, accumulators, electrical insulators and wireless apparatus.

Dutch Radio Exports

According to the information published by the Central Statistical Bureau the exports of both radio apparatus and wire filament lamps have declined in the past two years. The value of the radio exports amounted to 44,703,000 fl. in 1934 and diminished to 38,324,000 fl. in 1935 and further to 34,437,000 fl. last year. The values of exported wire filament lamps was 6,687,00 fl., 5,875,000 fl. and 5,583,000 fl. in the three years respectively.

Refrigerator Production in Argentina

A Buenos Aires firm which for some years has been manufacturing ice-boxes has now established a new works for the production of electric refrigerators. These will be fitted with motors imported from the United States. The new works will employ 1,000 people.

Illumination Design Course

The thirty-fifth illumination design course will commence at the Lighting Service Bureau, W.C.2, on March 8th, and will continue for four days.

New Electricity Showrooms

The Kent Electric Power Co., Rochester, has acquired the freehold of 178-184, Eastgate, which is to become the main offices and showroom of the company.

The Belgian Electrical Industry

The Department of Overseas Trade in Brussels is publishing booklets in English on various Belgian industries, each with a list of actual manufacturers, and we have received from the Commercial Counsellor of the Belgian Embassy, 103, Eaton Square, S.W.1, one of the series which deals with electric cables, motors, transformers, &c. Prospective buyers in these lines can obtain a copy free of charge from the Embassy.

Trade Announcements

Inquiries previously addressed to Space Heating, Ltd., 37-38, York Place, Leeds, should in future be addressed to Elexcel, Ltd. (Space Heating Department), Victor Works, Broad Green, Liverpool, 14, or any local branch of Elexcel, Ltd.

Bruce Peebles & Co., Ltd., have opened a new office at 19, Waterloo Street, Glasgow (telephone: Central 3369), which will be under the direction of Mr. G. Henderson, who has been appointed sales manager for Scotland.

H. E. Ashdown, Ltd., have recently opened a new factory at Eccleston, St. Helens, Lancs, which is equipped with up-to-date moulding machinery.

The London office of Switchgear & Cowans, Ltd., has been transferred to 85, Gracechurch Street, E.C.3 (telephone: Mansion House 9156).

The Edinburgh branch of the General Electric Co., Ltd., is moving on February 1st to 8, George Street.

The Birmingham Branch of Pope's Electric Lamp Co., Ltd., has removed to 3, Grosvenor Chambers, Broad Street Corner, Broad Street, Birmingham.

G. E. Wallis & Sons, Ltd., electrical engineers and contractors, are transferring their office organisation from Ashford to Broadmead Works, Maidstone (telephone: Maidstone 4055). The company will continue to maintain showrooms and repair shops at Ashford.

Orders Recently Booked

The Indian Government has just placed a contract with the Philips concern for the supply of four 10-kW short-wave transmitting stations for the All-India Radio organisation. All the stations will work on a wavelength between 30 and 90 metres.

New Zealand Cooker Imports

According to the *New Zealand Electrical Journal*, during the nine months to September 30th last 3,267 electric cookers, valued at £(N.Z.)44,462, were imported into New Zealand. The sources were as follows: Great Britain, 2,421 (£32,654); Canada, 815 (£11,651); United States, 27 (£120); Australia, 3 (£16); Germany, 1 (£21).

Price Increases

Oldham & Sons, Ltd., have increased the prices of their products, including wireless batteries, by 10 per cent.

The Strand Electric & Engineering Co., Ltd., announces that prices of goods listed in its catalogue dated May, 1936, with certain exceptions, have been advanced by a further 5 per cent., making a total advance of 10 per cent.

Social Events

The annual dinner of the British Institute of Engineering Technology and the British Tutorial Institute was held on January 20th at the Café Royal, Regent Street, W., Mr. G. Moore presiding in the absence of Mr. D. B. Drake, who was indisposed. Proposing the toast of "The Firm," Mr. G. Bond said that the Institutes had first established themselves in the British Isles and now had branches in India, Australia, Canada, and South Africa. He referred to the consideration which the directors showed to the staff, who had shared in the fruits of the success of the Institutes. Mr. J. J. Cleaver, in responding, reviewed the rapid progress made by the Institutes since their inception ten years ago, and in referring to future plans he mentioned that they were opening a branch in Palestine, and were also going to publish their own text books and a monthly journal. The toast of the Indian branch was proposed by Mr. R. S. Nehra, chairman of the Indian Advisory Board in London, who pointed out the immense scope for correspondence training in India, and Sir Abdul Qadir, member of the Council of the Secretary of State for India, responded. Mr. H. Hill proposed the toast of "The Ladies," Miss M. Watkin replying. The toast of "The Chairman" was given by Mr. H. Hum. Following dinner there was a cabaret by members of the staff and dancing.

The employés of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, have this year booked the whole of the seating accommodation for four nights at the Palace Theatre, Manchester, for the pantomime "Babes in the Wood." The first two parties witnessed the performances on Monday and Tuesday last, and the others have reserved the theatre for Monday and Tuesday next week. Each member of the audience receives a souvenir programme. The booking is double that of last year, and is due in part to the increased number of employés, now over 15,000. Following custom, the principals of the pantomime were entertained to lunch by the directors on January 23rd and afterwards toured the works.

The interest which the Hon. Mrs. Gamage takes in the younger members of the staff of the General Electric Co., Ltd., was amply evidenced on January 23rd when she took 200 of them to the Circus and Fun Fair at Olympia. After lunch at Magnet House, Kingsway, W.C.2, the party set off in five double-

The stands of the Chloride Electrical Storage Co., Ltd., and the General Electric Co., Ltd., at last week's exhibition of aerodrome equipment **(See page 167)**

decker buses for Olympia. The afternoon was spent in the Fun Fair, and the Hon. Mrs. Gamage presided over tea at the Pillar Hall Restaurant before taking her guests into the Circus. After the performance the party returned to Magnet House. A photograph of the party taken before leaving Magnet House appears on page 183.

On January 15th the directors of Elliott Brothers (London), Ltd., entertained to dinner members of the Elliot Long Service Association. The Association numbers eighty-five, of whom seventy were present. Mr. J. H. Hart, who has over fifty-two years' service to his credit, presided, and he was supported by Sir Keith Elphinstone, K.B.E., chairman of the company, who has been associated with the concern for forty-five years. Messrs. L. W. Smith, A. W. Atkyns, and R. O. Smith (directors) also attended. The toast of "The Firm" was proposed by Mr. W. A. Reed, and Mr. L. W. Smith responded. Mr. E. W. Phillips proposed the toast of "The chairman," and Mr. Hart suitably replied. The toasts were interspersed with items by well-known artistes.

Laurence, Scott & Electromotors, Ltd., held their annual dinner to the staff of the Norwich works on January 25th, when nearly 200 enjoyed a pleasant evening. Capt. G. J. Scott, acting as chairman in place of his father (who founded the firm in 1882 and is at present in India), proposed the toast of "The Firm." He said that the last two years had seen the greatest progress in the history of the company—progress not only in design, manufacture and volume of work but also in the standard of living of those who made such a record possible. Since 1933 the average weekly earnings of the workpeople at the Norwich works had increased by over 25 per cent. (despite the increase in the number of apprentices) and the staff salaries in the same period had improved by 23 per cent. The company's success was measured in prosperity and efficiency and above all in the happiness of the staff and workpeople. Mr. C. Laurence and Mr. H. S. Loebl replied. The entertainment was provided by members of the company under the direction of Mr. F. Coan.

For Sale

Goddard & Smith will sell a stock of electrical material by auction on February 10th at 13, High Holborn, W.C.1. (See our classified advertisements.)

A Cooker Display

The accompanying illustration shows one of two new displays which the English Electric Co., Ltd., has produced in connection with its cooker sales. Both displays make reference to "English Electric—King of the Kitchen," to describe the latest product of the company's Domestic and Heating Section. The rich colour treatment makes these displays particularly suitable for use by electricity undertakings and electrical showrooms during the Coronation celebrations, and as they have no direct reference to the Coronation they are also appropriate for display during the whole year.

ENGLISH ELECTRIC
King of the Kitchen
A Meal Fit for a King on all occasions
A Crowning achievement in Electrical Equipment for your home.

An "English Electric" cooker display

Trix Electrical Co., Ltd.

We regret that in arranging the list of manufacturers of electrical equipment for the Coronation mentioned in our Special Issue of January 15th (page 98) we rendered the name of the above company inaccurately and gave the wrong address. The name and address correctly stated are: The Trix Electrical Co., Ltd., 8 and 9, Clerkenwell Green, London, E.C.1. As noted in our article on "Public Address Equipment," the company has experience of outdoor theatre work, necessitating the employment of numerous concealed microphones, as well as of stadium and indoor amplification.

Domestic Lighting

On January 21st on the B.B.C. National Programme in the "At Home To-day" series Mr. J. B. Harris gave a short talk on "Domestic Lighting." He stressed the importance of good artificial lighting, and mentioned the necessity for avoiding such faults as the use of unshaded electric lamps. Hints were given on the lighting of the modern home, and the need for using local light units where close work is done, in order to avoid eyestrain and headaches and preserve eyesight, was mentioned.

French Electrical Imports and Exports

The French imports and exports of electrical machinery, apparatus and cognate material during the nine months ended with September last as compared with the corresponding period of 1935 are shown in the appended table. The values are given in thousands of francs, while, for purposes of comparison, the sterling value of the totals, converted at the rate of 105 fr. to the £, is added:—

	Imports. Jan.–Sept.		Exports. Jan.–Sept.	
	1935. 1,000 fr.	1936. 1,000 fr.	1935. 1,000 fr.	1936. 1,000 fr.
Dynamo electric machines, transformers and parts	26,451	22,035	18,721	15,833
Telephone, telegraph and other electrical appliances	92,659	84,205	69,160	49,141
Incandescent lamps and radio valves	30,164	28,504	9,730	9,853
Arc lamps and parts	73	111	53	15
Carbons for electrical and industrial purposes	4,390	3,904	9,455	8,952
Electric wires and cables ...	3,870	4,192	18,601	21,254
Parts of electrical apparatus ...	13,418	12,274	7,726	8,164
Magnets, other than electric ...	339	515	*	*
Accumulators and parts	1,133	1,045	7,952	6,788
Dry and wet batteries, condensers and parts	14,890	8,402	1,712	1,617
Porcelain and other insulators ...	1,225	1,106	5,536	6,589
Total fr. (thous.)	188,612	166,383	148,646	128,206
Total at 105 fr.	£1,792,495	£1,584,000	£1,415,676	£1,211,486

* Included with the preceding item.

It will be seen that the imports declined by £197,895 or about 11½ per cent. Of the eleven items scheduled only three show slight increases; on the other hand, eight show a decline. On the export side the decrease amounted to £204,190 or nearly 14½ per cent.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. January 27th	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¾d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£214	£1 inc.
Grade II... ... ... ,,	£148	£1 inc.
Grade III ... ... ,,	£77	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	8¼d.	—
c ,, Tubes (solid drawn ... ... ,,	11¼d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	9¼d.	—
c Copper Tubes (solid-drawn)... ... ... ,,	1/0¼d.	—
g ,, Bars (best selected) ... per ton	£85	£4 inc.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£57	—
d ,, Wire Rods ... ... ,,	£64	—
d ,, ,, H.C. Wire ... per lb.	9 5/8 d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/– plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	1/2	—
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£28 10s.	£1 10s. dec.
g Mercury ... ... per bot.	£14 5s.	—
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e ,, ,, ,, medium ... ,,	5/– to 10/–	—
e ,, ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2	—
p ,, ,, drawn bars & rods ,,	1/2d.	1d. inc.
p ,, ,, rolled strip & sheet ,,	1/1d.	½d. inc.
p ,, ,, wire ... ... ,,	1/2½d.	½d. inc.
o Platinum ... ... per oz.	£11 15s.	£2 inc.
d Silicium Bronze Wire ... ... per lb.	9 11/16 d.	
g Spelter ... ... per ton	£21 17 6	18s. 9d. inc.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g Tin, Block (English) ... ... per ton	£226 5s.	£4 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes."

Industrial Lighting

A section to be devoted particularly to industrial lighting is now being formed by the Illuminating Engineering Society. The members of the provisional committee are Mr. R. O. Ackerley (chairman), Mr. A. R. McGibbon, Mr. E. W. Murray, and Mr. H. C. Weston. All members of the Illuminating Engineering Society may attend the meetings of special sections, but those who wish to become associated with the industrial lighting section and to attend meetings should send in their names and addresses to the honorary secretary, Mr. J. W. Howell, 2, Savoy Hill, W.C.2.

A Refrigerator Convention

On Monday last the eleventh annual Frigidaire Salesmen's Convention was held at the Rudolf Steiner Hall, W. Mr. C. F. Dickson, managing director, opened the proceedings, and was followed by Mr. H. L. McGurk, director, from New York, who spoke on the European Frigidaire Club. Other speakers included Messrs. R. Beresford, G. G. H. Lawrence, W. Brett-Daniels, H. R. Power, and R. R. Poole. In the evening a banquet was held at the May Fair Hotel, W.1, Mr. Dickson presiding over a large gathering. Mr. McGurk, in a brief speech mentioned the rapid progress made by the company during the past few years, and made particular reference to the 3 cu. ft. cabinet which the company has recently commenced manufacturing at its Hendon factory. Mr. Dickson said that they now had one of the finest refrigerator factories in the country. The improvement in world conditions was making itself felt. People were spending more money than in recent years and the company was deriving the benefit of this improvement. Mr. H. R. Power proposed the toast of the guests, to which Mr. C. Rodd, of T. Wall & Sons, responded. The speeches were interspersed with an excellent cabaret. On Tuesday the delegates paid a visit of inspection to the company's Hendon works.

Aluminium Production in Tasmania

A *Reuter* message from Hobart (Tasmania) states that the Electrolytic Zinc Co. of Australasia has announced its intention of producing aluminium at its treatment plant at Risdon, near Hobart. This company will be the first enterprise to exploit the production of aluminium in Australia.

New Catalogues and Lists

Gent & Co., Ltd., Faraday Works, Leicester.—A catalogue of "Tangent" electro-motor syrens, morsing syrens, bell tollers and far-reaching sound signals.

W. Edwards & Co., Allendale Works, Vaughan Road, Loughboro' Junction, London, S.E.5.—A leaflet dealing with fractional h.p. motors.

English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.—Illustrated art catalogues dealing with steam turbine plant and Diesel engines. A pocket price list of motors and control gear has also been issued.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17.—"Anglites" are dealt with in a new booklet on commercial and utility lighting fittings.

Ferranti, Ltd., Hollinwood, Lancs.—Summation metering is the subject of a new technical illustrated booklet.

Time Switches & Instruments, Ltd., 120, Victoria Street, London, S.W.1.—A leaflet dealing with short period or staircase switches.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—New catalogues, illustrated and bound, dealing with cables and accessories and wiring systems, C.M.A. and "Nonazo" cables, t.r.s. cables, flexible cords, cables and accessories for wiring systems without earth continuity conductor, and cables and accessories for t.r.s wiring systems.

Electrical Components, Ltd., 102, Snow Hill, Birmingham, 4. —A 108-page illustrated catalogue of electric lighting fittings for the home.

Private Telephone & Electric Co., Ltd., Sardinia House, Kingsway, London, W.C.2.—A brochure dealing with the "Inter-Dial" telephone.

Bankruptcy Proceedings

C. H. Large, 1, Old Mill Road, Chelston, Torquay, trading as "The Torquay and South Devon Electrical Co.," electrician.—A surplus of £363 was disclosed at this public examination held on January 21st at the County Court Offices, Old Town Hall, Torquay. In reply to the Official Receiver, the debtor stated that about July, 1932, he and a relative entered into partnership and traded as the Torquay and South Devon Electrical Co. The partner contributed £200 by way of capital and the debtor's mother advanced £200. The partnership was dissolved in the following April, and the debtor's partner was repaid the £200 capital. The debtor said he was arranging for the trustee to pay 20s. in the £ to the creditors, and it was his intention to apply for the annulment of the bankruptcy. The examination was closed. Last day for receiving proofs for dividend February 6th. Trustee, Mr. J. S. Phillips, 1, Vaughan Parade, Torquay.

D. L. Gibson, carrying on business under the style of James Rush & Co., and The Hadrian Engineering Co., 31-33, Westgate Road, Newcastle-upon-Tyne, and Back Eldon Lane, Newcastle-upon-Tyne, wireless retailer and manufacturer.—The application for discharge herein was heard at the Court House, 56, Westgate Road, Newcastle-upon-Tyne, recently. The receiving order had been made in 1931. The discharge was granted subject to two months' suspension.

A. H. Lipman (trading as H. Lipman & Co.), electrical and general factor, 49, Jubilee Street, E.—This debtor again attended before Mr. Registrar Parton at the London Bankruptcy Court on January 15th for public examination upon accounts showing liabilities of £1,493 against assets of £22. He began business as above in August, 1931, and was successful until 1935, when the profits declined on account of severe competition. He attributed his insolvency to having traded on too narrow a margin of profit and to keen competition. The examination was concluded.

H. H. Moore, junior, electrical engineer, "The Lindens," West Cliff Gardens, Bournemouth.—Public examination February 18th at the Law Courts, Bournemouth.

G. F. Jenkins, 24, Browning Road, Enfield, Middlesex, electrician.—The public examination of the above debtor was held recently at the Court House, Upper Edmonton, N. According to the statement of affairs there were liabilities of £707 and assets of £25. The examination was adjourned for closing.

C. E. Pittman, electrical contractor and wireless engineer, 12, Station Road, West Croydon.—Application for discharge to be heard on February 17th at the County Court, Croydon.

J. H. Pasco (carrying on business as J. Danning), wireless engineer, 10, New Bridge Street, Truro.—Last day for receiving proofs for dividend February 3rd. Trustee, Mr. C. Hancock, 12, Princes Street, Truro, Official Receiver.

P. T. King, electrical engineer, 8, Buxton Road and 20, Gordon Street, Luton.—Supplemental dividend of 2¼d. in the £, payable January 26th at 6, The Parade, Northampton.

R. C. Marshall (Northern Service Depôt), radio dealer, 318, Stretford Road, Manchester.—Receiving order made January 20th on debtor's own petition.

D. S. Williams, electrical engineer and contractor, 342, Dewsbury Road, Leeds.—Trustee, Mr. C. H. Baker, 3, Alfred Street, Boar Lane, Leeds, released January 9th.

J. Vigon (Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road, E.1.—Supplemental dividend of 1¼d. in the £, payable any day (except Saturday) at Bankruptcy Buildings, Carey Street, W.C.

A. Boards (The Southern), radio dealer, 253, Barlow Moor Road, Chorlton-cum-Hardy, Manchester.—First and final dividend of 2s. in the £, payable January 29th at the Official Receiver's Office, Byrom Street, Manchester.

Company Liquidations

Dulcetto-Polyphon, Ltd., 2, Newman Street, W.1, gramophone, wireless and electrical dealers.—A meeting of creditors was held on January 22nd at the Holborn Restaurant, W.C.1, Mr. G. Willis, a director of the company, presiding. A statement of affairs was submitted which showed liabilities of £55,968, of which £50,968 was due to unsecured creditors, and the balance was in respect of contingent liabilities on leases, guarantees and bills discounted. The net assets were £56,908, leaving a surplus, subject to realisation, of £940. The chairman said that a receiver was appointed on January 11th last. Mr. Latham said that since the directors had come to the decision that the company must be wound up they had been active with a view to seeing if a purchaser could be found for the whole or part of the assets, and on the evening prior to the meeting he (Mr. Latham) received a tentative proposal for the assets of the company which was of sufficient importance to be considered. At the end of March, 1936, there was a debit on the profit and loss account of £45,946. The company was incorporated in April, 1928, to acquire the business of the British Polyphon Co., and its authorised and issued capital was £182,500. The creditors passed a resolution, subject to the shareholders agreeing to voluntary liquidation, that the voluntary liquidation of the company be confirmed, and that Mr. Latham be appointed liquidator, with a committee consisting of representatives of the Marconiphone Co., Ltd., A. C. Cossor, Ltd., General Electric Co., Ltd., Hohner Concessionaires, Ltd., and Philips Lamps, Ltd. The principal creditors are the following:—A. J. Balcombe, Ltd., £791; Chloride Electrical Storage Co., £510; Columbia Graphophone Co., Ltd., £7,368; A. C. Cossor, Ltd., £6,956; Edison Swan Electric Co., Ltd., £509; Ever Ready Co., Ltd., £956; General Electric Co., Ltd., £3,468; A. Guiterman & Co., Ltd., £615; Hohner Concessionaires, £1,925; Parlophone Co., Ltd., £4,058; Philips Lamps, Ltd., £3,754; Radio-Gramophone Development Co., Ltd., £1,152; Ultra Electric, Ltd., £1,531; R. Willis, £565; Britannia Batteries, Ltd. £566.

Rolls-Caydon, Ltd., radio and wireless manufacturers, Canberra Gardens, Barkingside, Essex.—The statutory meeting of creditors of the above was held recently at Winchester House, Old Broad Street, London, E.C. The statement of affairs showed ranking liabilities of £13,313 due to unsecured creditors. In addition, there was a fully secured creditor for £693, who held security valued at £900. After allowing £101 for preferential claims the net assets were £494, leaving a deficiency, so far as the creditors were concerned, of £12,819. The position was attributed to the heavy expense involved in the manufacture of wireless apparatus when the company's product came into competition with nationally advertised goods. Attempts were made to deal direct with the public, but that did not improve the trading of the company to any appreciable extent. Mr. McKeand and Mr. A. O. Saunders-Davies, two of the directors, intimated that they were prepared to waive one-half of their respective claims. Resolutions were passed confirming the voluntary liquidations of the company, with Mr. M. W. Wilson, 168, Regent Street, London, W., as liquidator, with a committee.

Vabest Co., Ltd.—Particulars of claims by February 10th to the liquidator, Mr. C. A. Roper, Regent House, Kingsway, W.C.2.

T. M. Johns & Co., Ltd.—Particulars of claims by February 16th to the joint liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2.

Electrical Power Developments (Western), Ltd.—Meeting February 19th at Mount Stuart Square, Cardiff, to receive an account of the winding-up by the liquidator, Mr. D. A. Onions.

Nox Electric Lamp Co., Ltd.—Meeting February 25th at 2, East Parade, Leeds, to receive an account of the winding-up by the liquidator, Mr. L. J. Coates. This notice refers solely to the affairs of the old company formerly carrying on business from Guiseley, near Leeds.

Dissolution of Partnership

Barber & Wilkes, electrical engineers, The Square, Cannock. —Messrs. W. Wilkes and F. J. Barber have dissolved partnership. Mr. Barber will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

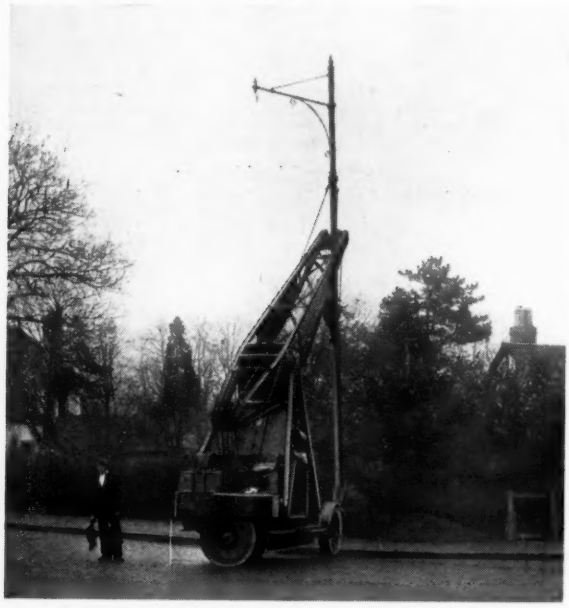
Addington.—EXTENSIONS.—The County of London Electric Supply Co., Ltd., is to lay further mains in the district at a cost of £1,790.

Amble (Northumberland).—MAINS AND SERVICES.—Application is to be made by the Urban District Council for sanction to borrow £3,000 for mains and services.

Bexhill.—A HIRE-PURCHASE FACILITY.—Where consumers move to the area of another undertaking and wish to transfer hire-purchase appliances on which instalments are still outstanding, the Electricity Committee proposes to make an allowance of 20 per cent. off the outstanding payments to the purchasing undertaking, such undertaking assuming responsibility for collection of the remaining instalments.

LOAN.—Sanction has been obtained to a loan of £6,000 for mains, meters and services.

Birmingham.—PROGRESS OF STREET LIGHTING SCHEME.—The accompanying photograph, sent to us by Mr. F. Forrest, chief engineer and manager of the Electric Supply Department,



Erecting an electric-discharge lamp standard in Harborne Road, Birmingham

shows workmen erecting one of the 3,634 electric-discharge lamp standards involved in the very comprehensive street lighting improvement scheme recently approved by the City Council.

Bradford.—SUPPLY EXTENSION.—The Corporation is to extend its supply to premises of the Bradford Dyers' Association, Ltd., at an estimated cost of £1,799.

Brighton.—MAINS.—The Electricity Committee has obtained sanction to borrow £4,234 for underground mains and £15,000 for electrical apparatus.

CHANGE-OVER.—A report by the electrical engineer recommending that, in order to avoid installing additional rectifier plant at the Droveway sub-station for the purpose of the d.c. supply in the neighbourhood, the necessary plant shall be installed so that a change-over to a.c. may take place progressively where desired, has been approved by the Electricity Committee. The cost is estimated at £1,015.

ELECTRIC SCHOOL HEATING.—The Education Committee has received a letter from the Ministry of Health to the effect that it will raise no objection to a limited system of direct electric heating in the re-modelled premises at Pelham Street school. The cost will be £1,445.

Croydon.—ELECTRIC HOT-WATER INSTALLATION.—It is proposed to install electric thermal storage plant in the Queen's Road Homes instead of extending the present boiler equipment. The Electricity Committee recommends that the boiler shall be installed by the Electricity Department at the cost of £6,928, and that the rates payable by the Public Assistance Committee for the supply shall be a standing charge of £50 per annum and a "unit" charge of 0.17d.

STREET LIGHTING.—The Electricity Committee has recommended the installation of mercury electric-discharge lamps for the lighting of Shirley Road, as a continuation of the existing discharge lighting in Lower Addiscombe Road.

Darlington.—IMPROVED LIGHTING.—The electrical and gas engineers are to submit schemes for improving the lighting in various main roads.

Fort William.—SUPPORT FOR CALEDONIAN SCHEME.—The Town Council is to support the Caledonian Power Order, and is sending a petition to the Secretary of State for Scotland.

Gosport.—DISSATISFACTION WITH STREET LIGHTING.—When it was proposed at a recent Council meeting that the street lighting contract with the local gas company should be extended for a year, a councillor moved the reference back of the recommendation with a view to tenders being invited. It was stated that members had been waiting for the expiration of the contract, hoping that some improvement might be effected. The chairman of the Roads and Works Committee explained that instructions were likely to be issued by the Ministry of Transport soon. The Council would have to pay for new fittings if at this time it arranged for a fresh contract. The Committee's recommendation was approved.

Great Yarmouth.—LOAN.—The Town Council is to apply for permission to borrow £35,000 for mains, services and domestic appliances.

Halifax.—REVISED TARIFF.—Mr. G. A. Vowles, borough electrical engineer and manager, informs us that the Light, Heat and Power Committee has decided to revise the tariff for electricity for industrial power purposes at an estimated annual cost to the undertaking of £8,500. Consumers will obtain reductions in their accounts varying from 9 to 15 per cent.

NEW FEEDER.—It has also been decided to apply for sanction to the borrowing of £5,962 for a new feeder along Wakefield Road, to the Copley district.

Hamilton (Lanarkshire).—ELECTRICAL DEVELOPMENT IMPEDED.—Several consumers and two deputations recently complained that they were unable to obtain electricity for purposes other than lighting. The burgh electrical engineer directed the attention of the Housing Committee to the restriction imposed on the use of electricity by resolutions of the Town Council contained in the minutes of the joint meeting of the Gas and Electricity Committees. He asked the Housing Committee that restriction on the use of electricity in burgh houses should be removed. The committee, however, made no recommendation.

Hull.—LOWER CHARGES.—The Electricity Committee is recommending tariff reductions amounting to £10,620.

Hungary.—OVERHEAD LINE CONSTRUCTION.—New transmission and distribution lines erected during 1935 aggregated 879 km. as compared with 524 km. in the previous year. At the end of 1935 there were in use 11,296 km. of high-voltage and 11,325 km. of low-voltage lines.

Liverpool.—SUPPLY TO WIRRAL RAILWAY.—The Corporation, it is understood, will supply electricity to the London Midland and Scottish Railway Co. for the operation of the Wirral Railway between Park Station (Birkenhead), and West Kirby and New Brighton. Both the Liverpool and the Birkenhead Corporations tendered for the contract and Liverpool's tender, being the lower, was accepted. Birkenhead Corporation then pointed out that it was not competent for the Liverpool Corporation to supply electricity in the Birkenhead Corporation's area of supply. The matter was argued at a special inquiry and the decision was in favour of the Liverpool Corporation.

London.—HACKNEY.—The present charge for the hire of a 1½-gal. water-heater is 2s. 6d. per quarter, with ½d. per kWh

Modern lighting at the new garage of Henlys, Ltd., on the Great West Road

consumed. The Electricity Committee now proposes to offer the heaters, as an alternative, at an "all in" charge of 1s. weekly, including rental, fixing and consumption.

BATTERSEA.—The Electricity Committee has obtained sanction to borrow £28,000 for mains and services and £20,500 for consumers' wiring installations.

FULHAM.—The Council proposes to sell the three 275-lb. Vickers Spearing and two 175-lb. Stirling boilers at the old generating station for £6,000 to the British Coated Board and Paper Mills, Ltd., for whom the Government is building a large paper factory at Treforest, near Cardiff. Upon the demolition of the old station the site will be used for a second coal silo.

Arrangements have been made for new main road lighting in the borough to be inaugurated by the Mayor on February 1st.

The borough electrical engineer, with the approval of the Electricity Committee, recently arranged with Gaumont-British Distributors, Ltd., for the production of a suitable film, 1,000 ft. in length, of the new power station. This is now finished. It will be available for exhibition during demonstrations at the showrooms and, in addition, the film concern has agreed to show a 300-ft. extract at some 170 of its cinemas throughout the country.

The Hon. Mrs. L. Gamage with young members of the G.E.C. staff outside Magnet House, Kingsway, W.C., before setting out for the Olympia Circus **(see note on page 179)**

Malton.—WIRING.—The Housing Committee has accepted the offers of the North Eastern Electric Supply Co., Ltd., and the York Corporation to provide service cables to the houses at Barton-le-Street and Swinton, and Foston and Sheriff Hutton, respectively.

New Zealand.—HYDRO-ELECTRIC SCHEME.—Work has now been started on the Cobb River hydro-electric scheme. The new generating station is intended to supply the whole of the Nelson district, taking the place of several smaller stations. In 1934 Messrs. Vickerman & Lancaster were engaged by the Hume Pipe Co. (Aust.), Ltd., to make an investigation into the possibilities of the various sources of water supply available and recommended the Cobb River scheme.

Newcastle-under-Lyme.—ELECTRIC STREET LIGHTING.—The surveyor and the electrical engineer have been instructed to prepare a scheme for the lighting of various streets by electricity.

Norton.—OVERHEAD LINES.—The Buckrose Light & Power Co., Ltd., is to erect overhead lines to provide supplies in the parishes of Canton, Sherburn and Willerby.

Rookhope (Co. Durham).—ELECTRIFYING A LEAD MINE.—It was recently announced that the Weardale Lead Co. intends to install electrical plant at its Boltsburn mine, Rookthope. This decision means that an electricity supply will be brought to Rookhope and householders will be able to share in the facility.

Shipley.—NEW CABLES.—Sanction has been obtained by the Electricity Committee to borrow £2,109 in connection with cable laying in Otley Road.

Stafford.—STREET LIGHTING.—When the question of improving the street lighting in the town was discussed by the Council recently it was stated that the advisability of employing more electricity had been raised in committee and was under consideration.

Staines.—SUB-STATION.—The Egham and Staines Electricity Co., Ltd., is to erect a sub-station in Stanwell New Road.

Stirling.—LOAN SANCTIONED.—The Town Council has received permission to borrow £13,732 for the extension of mains and services, and the provision of meters in connection with the electricity undertaking.

Stockton-on-Tees.—LOAN.—The Town Council is to apply for sanction to borrow £5,000 for mains and services.

Sunderland.—SUB-STATION.—The Town Council has acquired a site in Park Avenue North for the erection of an electricity sub-station.

United States.—NEW TRANSMISSION LINE FROM BOULDER CANYON.—The erection of a 230-kV transmission line from the Boulder Dam power plant to the Chino station of the Southern California Edison Co. is to be started early this year, states *Electric Light and Power*. The line will be 238 miles long and will be designed to transmit 165,000 kW. The cost will be about $3,750,000, and the work is expected to be completed by July 1st, 1938, approximately two years ahead of the time limit in the company's contract with the Federal Government.

HYDRO-ELECTRIC PROJECT.—The Arkansas Power & Light Co. is making a start on the construction of a third dam and hydro-electric station on the Ouachita River, 25 miles above the large Carpenter dam, dedicated in 1931, and 27 miles above the Remmel dam, completed in 1925. The cost is estimated at $4 million. The new power plant will have an initial capacity of about 23,800 kW, and it will be coupled with the other two plants. Construction will take from two to three years.

Weymouth.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to supply a new estate to be developed in Radipole Lane.

Worthing.—SUPPLY AT ANGMERING.—The Electricity Committee is to improve supplies at Angmering at a cost of £785.

York.—EXTENSION TO SHERIFF HUTTON.—The Electricity Committee is to erect an overhead line to supply Sheriff Hutton.

Traction

Bournemouth.—TROLLEY-BUSES.—Plans are being prepared for the extension of the trolley-bus service along Charminster Avenue.

Brighton.—TROLLEY-BUSES STILL UNDER CONSIDERATION.—The General Purposes Committee has resolved to instruct Mr. Arthur Collins to negotiate with the Brighton, Hove and District Omnibus Co. an arrangement by which the Corporation would seek powers to substitute trolley-buses, where advisable, and motor-buses elsewhere, for the Corporation tramways, the ownership and operation of those bus services remaining with the Corporation; the two systems to pool their receipts and divide the pool upon equitable terms, each party paying its own expenses and retaining its own surplus.

East Anglia.—ELECTRIC TRACTION SUGGESTED.—Speaking at a recent meeting at King's Lynn, Mr. P. H. Crosse, a London transport consultant, urged the claims of railway electrification between King's Lynn and London. Mr. R. B. Walker, former traffic manager of the M. & G.N.R., said that electrification would come, but the view of the railway companies was that the time was not yet opportune. He pointed out the difficulties which would be encountered with trains attaching and detaching vans and wagons at each wayside station, and said that speed did not affect sugar-beet traffic because the goods were supplied quicker than the factories could take them. By reason of the flat country there was a level crossing every half-mile of the twenty-seven miles between King's Lynn and Spalding. Efforts had been made to attract people to the East Coast without being able to dispel the impression that it was cold, and there was not sufficient traffic to justify the expense of electrification.

London.—QUIETER TUBE TRAINS.—At least £100,000 is to be spent by the London Passenger Transport Board in an endeavour to silence the tube trains. Nearly 450 miles of track is to have the rail sections welded together, and experiments are being carried out in the use of 90-ft. rail lengths in place of the usual 42 ft.

TRAFFIC SIGNALS IN PICCADILLY.—To replace the thirteen policemen who now regulate traffic at Piccadilly Circus a system of vehicle-controlled traffic signals is to be installed by the Westminster City Council.

Macclesfield.—ELECTRIFICATION URGED.—At a recent meeting of the Town Development and Publicity Committee the town clerk reported that he had been in communication with the London and North Eastern Railway Co. with a view to the

scheme of electrification in and around Manchester being extended to include the Manchester to Macclesfield line. The company had intimated that it was not able to do this. The Committee felt that a further effort should be made and instructions were given to the town clerk to communicate with the Member of Parliament for the Macclesfield Division.

Manchester.—PROPOSED TRANSPORT BOARD.—According to the *Financial Times* a step towards the creation of a Passenger Transport Board on the lines of the London Passenger Transport Board was taken in Manchester last week when a conference of railway, omnibus and local transport authorities appointed a sub-committee to draw up draft proposals. The conference, convened by the Lord Mayor, was attended by representatives of the L.M.S. and the L.N.E.R., three private road services and eleven municipal undertakings covering a wide area around Manchester from Stockport to Wigan and Rochdale. The proposed merger, excluding the railway companies, represents a capital value of over £12,000,000.

TRANSPORT POLICY.—A proposal to operate a further tram route by buses (twenty-two routes have already been converted) led the *Manchester Guardian* to interview Mr. R. Stuart Pilcher, general manager of the City Transport Department, on the undertaking's policy. He is reported to have said that the Department had always had to face difficulties in trying to please different people. To-day some wanted trams, some buses, while in a little while they would probably hear of some wanting trolley-buses. On the question of the comparative utility of trams and buses, he pointed out that figures showed that all over the country, and perhaps all over the world, tramways were being steadily abandoned. If trams had continued on the twenty-two abandoned routes in Manchester rail renewals would have cost ultimately £566,343, and the Department would have been pledged to tramway operation for the next twenty years; it was difficult to conceive of trams operating under modern conditions for that length of time. Following each abandonment the number of passengers had increased enormously. Women, he thought, travelled more on buses because of the much greater ease and safety in boarding them. Forty per cent. of the Department's vehicles were buses, which earned 47 per cent. of the revenue of the system and carried 41 per cent. of the total number of passengers; thus one bus of a smaller carrying capacity was doing the work of a much larger tram. The mileage per tram per week was 455, and per bus per week 714. He added that a good many applications were received from employés asking to be transferred from the trams to the buses.

New Zealand.—MORE TRAM PASSENGERS.—It is reported in the *New Zealand Electrical Journal* that a return of the Census and Statistics Office shows that tram passenger-journeys during 1935-36 totalled 131,651,395, or approximately 6,000,000 more than in the previous year, representing an increase of 5 per cent. The number is, however, much below the peak figure of 167,677,057 recorded in 1925-26. Wellington contributed the greatest absolute increase in passenger traffic (2,614,074), followed closely by Auckland (2,429,423). Christchurch and Dunedin increases were 511,076 and 428,667 respectively. Persons engaged during the year 1935-36 numbered 2,621, or thirty-eight more than in 1934-35, while salaries and wages paid advanced from £625,818 in 1934-35 to £672,161 in 1935-36. The financial statistics show that expenditure exceeded revenue by £48,751, the Wellington tramway undertaking being the only one to record a surplus. The sum of £19,272 was expended in capital outlay during 1935-36, bringing the total amount of capital expenditure to date to £5,528,022. Accrued funds at March 31st, 1936, amounted to £2,362,968.

NEW ELECTRIFIED LINES.—Increased suburban railway traffic in the Wellington district is anticipated as a result of electric traction, states the *Railway Gazette*. Electric locomotives will be used on the deviation by way of Tawa Flat to Paekakariki, but the Wellington-Johnsonville electrified line will be operated on the multiple-unit system. The introduction of electric trains will speed up the suburban services, enabling residents of Tawa Flat, for example, to reach town in fifteen minutes. It is expected that this improvement in railway transport will promote extensive housing in the outer suburbs. The new services this year are expected to create a demand for the doubling of certain lines and electric traction round other metropolitan centres.

Scandinavia.—ENCOURAGING TRAMWAY REPORT.—The municipal tramway undertaking of Göteborg, Sweden, reports that more people are using the services. The number of passenger-journeys in 1936 is given at about 68 millions, as compared with 65 millions the year before.

PROGRESS IN NORWAY.—The electrification of Norwegian railways was continued throughout 1936. The sections Oslo-Drammen, Drammen-Hoksund and Hoksund-Kongsberg were electrified by the end of the year, and an extension bevond Kongsberg is to be carried out this year. The Oslo to Kolbotn line is now electrically operated and a further section from Kolbotn to Skien is being electrified. No decision has been made in regard to the Kornsiö line (Oslo-Stockholm), although electrification on the Swedish side is already in progress.

Russia.—MOSCOW UNDERGROUND RAILWAY.—The second section of the Moscow underground railway will be finished this year within the time limit fixed by the Government, states *Reuter's Trade Service* from Moscow. At the same time the authorities have decided that work must be started this year on the third section of the railway, and have allotted a sum of 50,000,000 roubles for the purpose. It will consist of a double-track route 9.6 kilometres (6 miles) long. Between Tagansk Square and Crimea Square the lines will twice pass under the River Moscow. The tunnels will be driven by means of a shield and reinforced with cast-iron tubing. The construction of this section is to be completed by the end of 1939. Last year the Moscow underground railway carried 110,500,000 passengers.

Communications

Russia.—RADIO DEVELOPMENT.—A new radio station is to be put into operation within the next few days in Yakutsk. This station is to connect the district by direct radio-telephone and radio-telegraph communication with Moscow, Novosibirsk, Irkutsk and other important centres. During 1937 seven new telephoto transmission lines will be put into operation, and by the end of the year new television centres will be opened in Moscow and Leningrad. According to Mr. Proskuryakov, chief of the Radio Development Department of the All-Union Radio Committee, it is proposed to install nearly two million new radio receivers, 50 per cent. of them in collective and State farms.

TELEPHONES FOR RUSSIAN VILLAGES.—A sum of one million roubles was expended in 1936 on the installation of telephones in the rural districts of White Russia. Of the 1,470 villages, 1,215 now have telephone facilities, and it is proposed to complete the work this year.

Scandinavia.—NEW TRANSMITTERS.—Beside new short-wave transmitters of higher power than those at present in operation in Norway, Denmark and Sweden, medium- and long-wave stations are planned. Work has been started on the erection of a new 100-kW station near Reykjavik, Iceland. The Swedish Post Office recently granted over one million kroner for the erection of two new local relay stations at Helsingborg and Karlskrona, and a 100-kW northern regional transmitter at Lulea. Several new stations of 10 to 20 kW are in course of construction in Norway, and the Finnish authorities have ordered a new 20-kW station to be erected near Vasa. It is further proposed to increase the output of the Lahti long-wave station from 150 to 250 kW. A new short-wave (beam) transmitter of 5 kW, erected on a site near Skamlebæk, Sealand, will be put into commission on April 1st. The transmitter is equipped with a directional aerial and is designed particularly for overseas listeners.

RADIO SHOW.—The first Radio Show of international dimensions to be held in Oslo was opened on January 15th, and closes this week. The main feature is a demonstration of modern German television apparatus (375-line scanning), a special studio surrounded by glass walls having been erected for the purpose. Apart from a number of other technical attractions, there is a representative display of 1937 sets, a radio museum and a department containing amateur transmitters, anti-interference equipment, and radio apparatus for ships, aircraft and other commercial and military purposes. The event has caused a substantial increase in applications for radio licences, and the demand for receivers is such that many dealers have had their stocks exhausted.

RADIO FOR FISHING FLEETS.—In Norway a special effort is being made to encourage the use of radio apparatus among the fishing fleet. Iceland has started a national campaign to the same end; it is believed that the Government will be prepared to help financially.

POLICE RADIO.—The Oslo police are the first in Scandinavia to adopt special radio arrangements, a transmitter operating on 10 metres having been installed at the police headquarters, while ten cars have been equipped with receivers. In Stockholm and Copenhagen police radio is in the experimental stage.

RELAY SCHEME.—In Karlshamn the Swedish Post Office is trying out a method of relaying three different broadcast programmes simultaneously over the telephone network. Subscribers can use their telephones independently of the broadcast relays. It is understood that a similar system will shortly be experimented with in Norway, where ordinary broadcast reception in many regions is extremely difficult owing to the geographical and climatic conditions.

NORWEGIAN PROJECTS.—The 1937-38 Norwegian Budget provides about 2.7 million kr. for the laying of new telephone cables, 1¼ million kr. for automatic exchanges and 770,000 kr. for new high-frequency channels for broadcasting.

NATIONALISING TELEPHONES.—A special Parliamentary committee has been appointed by the Danish Minister of Public Works to investigate the advisability of the telephone networks of a number of private telephone companies whose concessions expire in 1939 being taken over by the Post Office.

Solving Supply Network Problems

Five companies in the United States requiring to determine accurately the load limits and stability of their systems have recently employed the Westinghouse a.c. calculating board to analyse their networks problems. During the past year in the United States eighteen major system investigations, involving plants up to 500,000 kVA capacity, have been completed on this board. This is claimed to be the largest a.c. calculating board built to date, with three hundred circuits, and it can readily duplicate, by miniature replica, any power system in the United States. By the use of the board system stability, power factor correction, load voltage regulation studies, and the best situations for new generating, transformer and line equipment are readily determined.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Barry.—February 13th. U.D.C. Stores, including electric lamps, bells, conduit fittings, &c., for one year. E. R. Hinchsliff, surveyor to the Council, Council Offices.

Birmingham.—February 5th. Electric Supply Committee. A.c. and d.c. distribution boards. (January 22nd.)
February 17th. Public Health and Maternity and Child Welfare Committee. Electrical and engineering services in connection with extensions and additions at the Little Bromwich Hospital. Particulars from F. H. C. Wiltshire, town clerk, Council House (deposit £2 2s. each service), by January 30th.

Bishop's Stortford.—February 8th. U.D.C. Duplicate sets of electrically driven horizontal turbine pumping plant, with incidental works. Surveyor, Council Offices (deposit £2 2s.).

Bristol.—February 8th. Corporation. 6.6-kV and 11-kV transformers. (January 22nd.)

Bromley.—February 8th. Electricity Department. Cables. (See this issue.)

Bury.—January 30th. Corporation. Thermostatically controlled fire detectors and alarms in the Market Hall. P. H. Lawson, markets superintendent, Market Hall.

Cardiff.—February 8th. R.D.C. Electric wiring in consumers' premises under the assisted wiring scheme during twelve months. H. Jackson, electrical engineer and manager, 20, Park Place (deposit £1 1s.).
February 8th. R.D.C. Electricity Department. Supplies during one year. (January 22nd.)

Cheadle and Gatley.—February 16th. U.D.C. Electricity Department. Twelve months' supply of electrical stores. (See this issue.)

Clitheroe.—February 13th. Electricity Department. One year's supply of electrical materials. (See this issue.)

Dewsbury.—February 10th. Town Council. One electrically driven unchokeable pump unit with a capacity of 250-gal. per min. Manager, Sewage Disposal Works, Mitchell Laithes.
February 2nd. Electrical wiring of 256 houses on the Dewsbury Moor housing estate. Borough electrical engineer, Bradford Road.

Edinburgh.—February 15th. City Council. Pneumatic ash handling plant for the Portobello generating station. (January 22nd.)
February 10th. Electric goods and passenger lift at the Portobello power station. City architect.

Erith.—February 12th. U.D.C. Electricity Department. Dismantling and removal from site and making good of site, of 1,180 yds. of overhead line. (January 22nd.)

Farnworth.—February 10th. U.D.C. Electricity Department. Electrical stores for twelve months. (See this issue.)

Fife.—February 1st. County Council. Electric lighting at forty-four houses at Blairhall. C. R. Douglas & Son, surveyors, 15, East Port, Dunfermline (deposit £1 1s.).

Gloucester.—City Council. One 6,000-kVA transformer. (See this issue.)

Halifax.—February 9th. Light, Heat & Power Committee. 250,000-kVA, 6,600-V, duplicate bus-bar metal-clad switchgear, steel control panels, turbine telegraphs, &c. (January 15th.)

Heston & Isleworth.—February 3rd. Borough Council. Electrical supplies for one year. (See this issue.)
February 15th. Electrically driven tower wagon. (See this issue.)

Hull.—February 5th. Transport Department. Various stores, including carbon brushes for traction motors, during twelve months. J. Lawson, general manager, Transport Offices, Ferensway.

India.—February 5th. Bombay, Baroda & Central India Railway Co. Motor-driven air compressor. (January 15th.)

Kettering.—February 19th. U.D.C. Electricity Department. Transformer, cables and a.c. meters. (January 22nd.)

Kingston-upon-Thames.—February 3rd. Borough Council. Supplies for twelve months. (January 22nd.)

Lanark.—County Council. Various works, including electrical and heating installations, at East Kilbride Primary School. Particulars from J. Stewart, County architect, 32-36, Albert Street, Motherwell, by February 1st.

Leeds.—February 16th. Corporation. Various stores for twelve months. (See this issue.)

Leyton.—February 9th. Corporation. Two 500-kVA transformers and h.v. switchgear. (See this issue.)

Liverpool.—February 4th. Corporation. Engineers' and electrical supplies. Town Clerk's Office, Municipal Buildings, Dale Street.
February 22nd. Trucks, air-brake and electrical equipment for 100 tramcars. (See this issue.)

London. — BATTERSEA. — February 3rd. Borough Council. Electrical stores for one year. (January 15th.)
POPLAR.—February 10th. Borough Council. Stores for twelve months. (January 22nd.)
STEPNEY.—February 2nd. Borough Council. Electric lighting and heating installation in the Public Library, Mile End. Borough engineer and surveyor, Municipal Offices, Raine Street (deposit £5).
KENSINGTON.—February 10th. Borough Council. Various works and stores, including electrical goods, lamp fittings and columns for one year. Town Clerk's Office, Town Hall, W.8.

Long Eaton.—February 12th. U.D.C. Electricity Department. Twelve months' supply of cut-outs, meters and cables. (See this issue.)

Manchester.—February 9th. Transport Committee. General stores, including armature and field coils, controller fingers, switches, tubing, cells, insulation material, carbon brushes, overhead equipment, electrodes, cable, wire, &c. General manager, Corporation Transport Department, 55, Piccadilly.

Middlesex.—February 22nd. County Council. 1,000-mA X-ray unit and associated equipment and modification of existing apparatus at the West Middlesex County Hospital, Isleworth. (January 22nd.)
February 20th. Electrical installations and replacement of d.c. distribution system and apparatus by a.c. equipment at the Central Middlesex County Hospital. (January 22nd.)
February 8th. Electric lighting, heating and power, telephone and bell installations at Tottenham Polytechnic, and electrical installations at Wembley Park County school. (See this issue.)

Newburgh (FIFE).—Town Council. Electrical work in forty-six houses. L. A. Rolland, surveyor, 47, High Street, Leven.

New Zealand.—DUNEDIN.—February 24th. Tramways Department. Trolley wire. (T.Y. 31078.)*

Northern Ireland.—LONDON, MIDLAND AND SCOTTISH RLY. CO. —February 5th. Northern Counties Committee (Ireland). General stores, including wire, telegraph ironwork, electric lamps, porous pots, &c., for twelve months. F. J. Martin, stores superintendent, York Road Station (6d.).

Oban.—February 1st. Town Council. Electric lighting in sixty-four houses. D. Galloway, burgh surveyor.

Oldham.—February 9th. Electricity Committee. Cable. (See this issue.)

Plymouth.—February 6th. Corporation. Cables, meters, time switches and wireless rectifiers. (January 22nd.)

Salford.—February 17th. City Council. Electrical stores. (See this issue.)

Sheffield.—February 8th. Transport Committee. General supplies, including tramcar resistances. H. Watson, general manager, Division Street.

Skipton.—February 2nd. U.D.C. Electricity Department. One 300-kVA transformer. (See this issue)

South Africa.—PRETORIA.—February 26th. Union Tender and Supplies Board. Fifteen stationary batteries. (T.Y. 31081.)*
CAPETOWN.—February 24th. Electricity Department. Miniature circuit-breakers for house service connections. (T.Y. 31091.)*
JOHANNESBURG.—February 13th. City Council. Transformers. (T. 31084.)*

Southampton.—February 9th. Electricity Department. Electricity meters and domestic electric cookers. (See this issue.)

Southend-on-Sea.—February 2nd. Corporation. H.v. and l.v. underground cables for two years and a section of overhead h.v. line. (January 15th.)
February 4th. Electrical stores for twelve months. (January 15th.)

Stoke-on-Trent.—February 3rd. North-West Midlands Joint Electricity Authority. Outdoor type static transformers and electricity meters. (January 15th.)
February 10th. Electrical Engineer's Department. Twelve months 'supply of mains and cables, transformers and meters. (See this issue.)

Uruguay. — MONTEVIDEO. — March 2nd. State Electricity Supply and Telephones Administration. L.c. cable. (T.Y. 31100.)*

West Lothian.—February 6th. County Council. Electric lighting installation in 222 houses. F. Smith & Brown, 4, Regent Street, Hamilton.

West Riding.—January 30th. Public Assistance Committee. Electrical wiring in connection with the installation of calorifiers, pumps, motors, &c., at the County Public Assistance Institution, Batley. P. O. Platts, architect, County Hall, Wakefield.

Winchester.—February 12th. Electricity Department. Underground cables during thirteen months. (January 22nd.)

Worsley.—February 10th. U.D.C. Various stores, including electric lamps, for twelve months. J. Howard, surveyor to the Council, Town Hall, Walkden.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Bexhill.—Water Committee. Accepted. Two generators (£476).—Mather & Platt, Ltd. Switchboard (£117).—Standard Switchgear, Ltd. Two electrically driven surface pumps with Brookhirst starters (£542).—Harland Engineering Co. One electrically driven borehole pump with Brookhirst starter (£821).—Worthington Simpson. Ltd. One two-stage compressor (£170).—Ruston & Hornsby, Ltd.

Brighton.—Electricity Committee. Accepted. Battery replacements at Southwick power station (£2,250).—Tudor Accumulator Co. Two electric and one steam boiler feed pumps (£3,397) and electric pumping plant (£1,739).—Mather & Platt.

High-pressure steam valves (£2,497).—Dewrance & Co. Circulating water valves (£3,432).—J. Blakeborough & Sons. Copper expansion pieces (£800) and piping (£4,195).—Aiton & Co.

Croydon.—Electricity Committee. Recommended. Ash hopper (£1,500).—Bennis Combustion, Ltd. Switchgear (£3,981).—Met.-Vick. Elecl. Co.

Exeter.—Navigation Committee. Accepted. Erection of overhead cable at the docks (£177).—Woodland & Stephens.

Electricity Committee. Accepted. Two switchboards (£1,099).—Met.-Vick. Elecl. Co.

Glasgow.—Health Committee. Recommended. Repairs to electrical apparatus at Hawkhead Hospital (£417).—Bastian & Allen, Ltd.

Housing Committee. Accepted. Electrical installation in 132 houses at the Ballindalloch Drive estate (£584).—A. & C. Edelman, Ltd.

Transport Committee. Accepted. Lead acid batteries.—Chloride Electrical Storage Co.; Fuller Accumulator Co.; C.A.V. Bosch, Ltd. (per Thomas Scott & Co.).

London.—WESTMINSTER. — Highways Committee. Recommended. Traffic signals: Piccadilly Circus (£3,950), Conduit Street (£139), Regent Street (£770), and Shaftesbury Avenue (£650).—Automatic Telephone & Electric Co.

HACKNEY.—Works and Open Spaces Committee. Electric vehicle battery (£143, less £20 for old battery).—Chloride Electrical Storage Co. Electric vehicle, including new battery (£1,075).—Electricars, Ltd.

Electricity Committee. Recommended. Supplies during the period to March 31st, 1938. P.i. cables.—B.I. Cables. Transformers.—Johnson & Phillips. Vulcanised india rubber and l.c. cables.—W. Geipel. One 30,000-kW turbo-alternator, condensing plant, feed heating system, evaporator, boiler feed pumps and steam and other piping and valves for the generating station :

	£		£
Brush Electrical Engineering Co.	109,672	**C. A. Parsons and Co. Recommended**	**114,751**
General Electric Co.	109,672	British Thomson-Houston Co.	116,365
Richardsons, Westgarth - Brown, Boveri	109,672	English Electric Co.	116,365
		Metropolitan Vickers Electrical Co.	116,365

It is also recommended that the condensing plant to be supplied by C. A. Parsons & Co. should be manufactured by Hick, Hargreaves & Co. at £29,654, this amount being included in the above tender prices.

BATTERSEA.—Electricity Committee. Accepted. Rewinding 500-kVA transformer (£108).—British Electric Transformer Co.

STEPNEY.—Finance and Parliamentary Committee. Recommended. Traffic control signals at the junction of Bow Common Lane and Eric Street (£1,470, including free service maintenance for two years, and then a maintenance charge of £18 per annum for nine years).—Automatic Telephone & Electric Co.

Electricity Supply Committee. Recommended. Twelve single feeder boxes (£128).—G. P. Cosway. House service cut-outs during one year (£573).—Henley's.

FULHAM.—Electricity and Lighting Committee. Recommended. Extension of fire protection equipment at the Central sub-station (£425).—Mather & Platt.

Maternity and Child Welfare Committee. Recommended. One bed lift and two service lifts at the new Maternity Home and Clinic, including levelling apparatus for the service lifts (£856).—Express Lift Co.

Middlesbrough.—Town Council. Accepted. Electric cables.—Hackbridge Cable Co. Electric lift in new workshops for the Gas Department.—Pickerings, Ltd.

Seaton Valley.—U.D.C. Accepted. Electrical installations in ninety-eight houses on the Grange estate.—Watson-Norie.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, February 4th. Grosvenor House, London, W.1. 7 for 7.30 p.m. Annual dinner and reunion.

North-Eastern Centre.—Friday, January 29th. Old Assembly Rooms, Newcastle-upon-Tyne. 7.30 for 8 p.m. Annual dinner and dance.

South Midland Centre.—Monday, February 1st. James Watt Memorial Institute, Birmingham. 7 p.m. Joint meeting with the Institution of Post Office Electrical Engineers. "Recent Developments in Telegraph Transmission and their Applications to the British Telegraph Services." Messrs. L. H. Harris, E. H. Jolley and F. O. Morrell.

North Midland Centre.—Tuesday, February 2nd. Hotel Metropole, Leeds. 7 p.m. "Luminescence." Mr. L. J. Davies.

North-Western Centre.—Tuesday, February 2nd. Engineers' Club, Manchester. 7.15 p.m. "Layout and Rupturing Capacity of Protective Devices in Motor Circuits." Mr. J. O. Knowles.

Wireless Section.—Wednesday, February 3rd. Institution, London, W.C.2. 6 p.m. Discussion on "A Specification for Testing and Expressing the Performance of Radio Receivers." To be opened by Mr. Stuart Hill.

Electrical Engineers' Dance.—Friday, January 29th. Grand Hotel, Harrogate. 8 p.m.

Electrical Trades' Commercial Travellers' Association.—Friday, January 29th. Connaught Rooms, London, W.C.2. 6.30 for 7 p.m. Annual dinner.

Birmingham Electric Club.—Monday, February 1st. Grand Hotel, Birmingham. 7 p.m. Presidential address.

Electrical Development Association.—Monday, February 1st, to Wednesday, February 3rd. Sales management conference.

Association of Mining Electrical Engineers *(London Branch).*—Tuesday, February 2nd. Junior Institution of Engineers, London, S.W.1. 6.30 p.m. "Coal Drills." Mr. C. E. Luxton.

Electrical Engineers' Ball.—Friday, February 5th. Grosvenor House, London, W.1.

Electrical Power Engineers' Association *(London Technical Group).*—Saturday, February 6th. Café Royal, London, W.1. Annual dinner and dance.

Notes

E.I.B.A.

Mr. A. Hugh Seabrook, executive officer of the Electrical Industries Benevolent Association, informs us that the annual general meeting and luncheon of the Association is to be held at the Savoy Hotel on Friday, April 9th.

E.A.W. Activities

In the absence of Captain H. de A. Donisthorpe, of the General Electric Co., Ltd. (Osram Valve Department), Mr. W. G. J. Nixon addressed the Hull and East Riding Branch of the Electrical Association for Women on January 20th. His subject was "The Evolution of Broadcasting." Mrs. B. Waite (branch chairman) welcomed the lecturer, and was supported by Mr. C. I. Shuttleworth, deputy electrical engineer. There was an attendance of over eighty.

Following the annual general meeting of the Teachers' Circle of the Electrical Association for Women at its headquarters at 20, Regent Street, W.1, on January 20th, a film entitled "Motion Study in the Home" was shown. After this there was a discussion on the teaching of electricity in schools.

E.P.E.A. (Kent Section) Dinner

The annual dinner of the Kent Section of the Electrical Power Engineers' Association will be held on March 20th at the County Hotel, Ashford. Tickets can be obtained from Mr. P. R. Caister, hon. secretary, dinner committee, 339, Hythe Road, Willesborough, Ashford.

Old Faradians' Dance

The annual dance of the Faraday House Old Students' Association is to be held at the Wharncliffe Rooms, Hotel Great Central, London, N.W.1, on Thursday, March 4th, from 8 p.m. to 2 a.m. Tickets can be obtained from the Rev. L. Van Vestraut, hon. secretary of the Association, Faraday House, 66, Southampton Row, London, W.C.1, price 7s. 6d. single and 15s. double.

Metal Degreasing

Solvent methods of degreasing metals prior to vitreous enamelling were the subject of a lecture delivered by Dr. N. R. Hood (I.C.I., Ltd.) before a meeting of the Institute of Vitreous Enamellers in London on January 15th. The lecturer compared mechanical wiping and sand blasting, burning-off and chemical solvent methods.

Reducing Noise in Sub-stations

At the recent Congress of the International Union of Electric Power Producers and Distributors a report was presented by the Société d'Electricité de l'Escaut (Belgium) on tests it had carried out with the object of reducing noise in static transformer sub-stations. Mounting transformers on insulating flexible bases and replacing the rigid connections by cables were first tried. While successful, these modifications demonstrated that the noise was transmitted to the building not by any mechanical action but by acoustics. It was consequently decided to install asbestos curtains hung in the passageways at equal distances from each other and these were found to be most effective in reducing the noise.

Appointments Vacant

City electrical engineer for Aberdeen.

Civilian wireless instructors for the Electrical and Wireless School, R.A.F., Cranwell, Lincs.

Assistant lady demonstrator for Colchester electricity undertaking.

Electrical engineers for the Irish Free State Electricity Supply Board.

Stocks and stores accounts clerk for Walsall Electricity Department.

Draughtsman, Grade I, at Bawdsley Research Station for the Air Ministry.

Sub-station attendant for Torquay electricity undertaking.

Meter tester and repairer for Coventry Electricity Department.

Grade "B" clerk for Heston and Isleworth Electricity Department.

(See our classified advertisements.)

Lady demonstrator and showroom assistant for Gravesend electricity undertaking.

Electricians for the Rhodesia Broken Hill Development Co., Ltd.

Distribution superintendent for Croydon Electricity Department.

Graduate assistant master for tele-communications at the South-East London Technical Institute.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

Amber glass aeroplane tube suspension fittings.

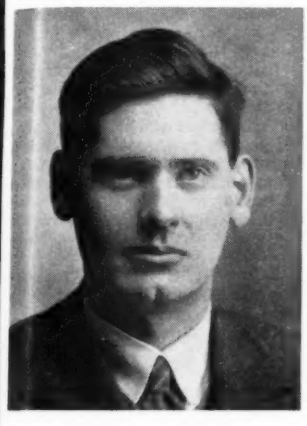
WESSEX wrought-iron and wood electric lighting fittings of period design.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. G. Park, A.M.I.E.E., A.Amer.I.E.E., has resigned from his post as district engineer with the Electricity Board for Northern Ireland, following his appointment to the technical staff of the Metropolitan Electric Supply Co. Mr. Park received his technical education at the Victoria University of Manchester and later joined the staff of the Lancashire Electric Power Co. He went to Northern Ireland early in 1935, and, on his resignation recently, was presented by the district staff with a gold-mounted writing set. He is succeeded by **Mr. W. J. Adair,** who was previously engineer for the Lurgan district. An article by Mr. Park on "Rural Supply Networks" was published in the ELECTRICAL REVIEW of January 8th last.



Mr. J. G. Park

Professor F. Bacon, University College, Swansea, was installed as president of the South Wales Institute of Engineers at Cardiff on January 21st in succession to Mr. F. Llewellyn Jacob. Professor Bacon received his early training with Plenty & Son, marine engineers, Newbury, and afterwards went to Trinity College, Cambridge. From there he went to Yarrow & Co., Poplar, and later joined the British Westinghouse Electrical & Manufacturing Co. (now the Metropolitan-Vickers Electrical Co., Ltd.). In 1905 he joined the staff of the Royal Naval College, Greenwich, and became Professor of Engineering at Cardiff in 1913. After war service he was transferred in 1920 to the then recently-inaugurated University College, Swansea.

Mr. L. F. Christy, a director of Christy Bros. & Co., Ltd., Chelmsford, was presented with his portrait in oils on January 22nd to mark his fifty years' association with the firm. The presentation was the gift of the directors and employés, and it was made at the annual staff social. Among those present were representatives of the company's interests in other parts of the country, including Mr. H. W. Knapp, manager of the West Devon Electric Supply Co., Ltd.; Messrs. E. W. Tole, manager, and L. Franks, secretary, of the North Somerset Electric Supply Co., Ltd.; Messrs. W. H. Gatley (St. Neots branch); W. Tincknell (Cullompton branch); and G. W. Balls (Bristol branch). Mr. Frank Christy, chairman of the company, presided. The presentation of the portrait and an album containing the names of the subscribers was made by Mrs. Robinson, the wife of Mr. A. J. Robinson, who is in charge of the power station at Aldeburgh, and was prevented by ill-health from attending.

Mr. H. C. Spence, distribution superintendent, has been appointed chief technical assistant to the Croydon Corporation Electricity Department at a salary of £1,000, rising to £1,200, per annum. Mr. Spence received his technical training at the Dundee Technical College and the Royal Technical College, Glasgow, and in the Dundee Corporation Electricity Department and subsequently held appointments with the Glasgow Corporation Electricity Department and the Yorkshire Electric Power Co. In 1929 he was appointed electrical engineer and manager to the Holmfirth Urban District Council's Electricity Department, and relinquished that appointment in 1933 to join the staff of the Croydon Corporation as deputy distribution superintendent.

Mr. H. C. Spence

Mr. W. Briggs, the author of the article on "Rupturing Capacity" on page 162, studied electrical engineering at the Manchester College of Technology and the Royal Technical College, Salford. He has been with Messrs. Erskine Heap & Co., Ltd., for a number of years and has been in charge of their estimating department since 1921.

Mr. D. C. Thomson, B.Sc., A.M.I.E.E., has been appointed deputy borough electrical engineer at Finchley. He joined the Finchley electricity undertaking in July last as chief assistant engineer, and was previously with W. T. Henley's Telegraph Works Co., Ltd.

Mr. W. E. Foden, chief financial officer of the Manchester Corporation Electricity Department, is retiring on superannuation after thirty-eight years' service with the Corporation.

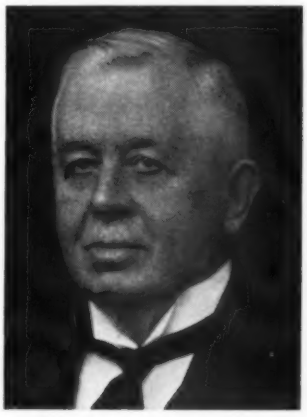
We are pleased to learn that **Dr. C. C. Garrard,** of the General Electric Co., Ltd., who has been in a nursing home for an eye operation, is making good progress, and that **Dr. W. Wilson,** of the same company, has made a satisfactory recovery from his recent operation.

Mr. R. S. Atkinson, who is at present with the Hull Corporation Electricity Department, has been appointed charge engineer to the Bradford Corporation Electricity Department.

Mr. H. C. Siddeley, M.I.E.E., informs us that his address in Buenos Aires is now care of Messrs. H. W. Roberts & Co., Piedras 353, Buenos Aires.

The Council of the Institution of Electrical Engineers has made the fifteenth award of the Faraday Medal to **Professor André Blondel,** of Paris, the inventor of the oscillograph and contributor to wireless knowledge and the theory of electric motors.

Dr. Alexander Russell, M.A., D.Sc., LL.D., F.R.S., has been elected an honorary member of the Institution of Electrical Engineers. Dr. Russell was president of the Institution in 1923 and has received an Extra and the Overseas Premiums for contributions to the Institution's proceedings. He has been Principal of the Faraday House Electrical Engineering College for many years.



[Elliott & Fry

Dr. Alexander Russell

Mr. H. H. Lackenby has been appointed Midland representative of the Normand Electric Co., Ltd.

Mr. C. A. Carlow, managing director of the Fife Coal Co., will take office as president of the Institution of Mining Engineers on February 3rd, when he will deliver an address to the annual meeting of the Institution at Burlington House, W. Mr. C. A. Carlow has been president of the Association of Mining Electrical Engineers.

Obituary

Mr. G. G. Callender.—The *New Zealand Electrical Journal* reports the recent death at Wellington, after a short illness, of Mr. G. G. Callender, manager for New Zealand of the Metropolitan-Vickers Electrical Co., Ltd. He was forty-five years of age.

Ald. E. M. Dence.—The death is announced, at the age of sixty-three, of Alderman Ernest Martin Dence, who was for some years with Johnson & Philips, Ltd., and for a part of the time was a director. He retired in 1919.

Mr. Michael Segrave, A.M.I.E.E., of 115, Hodges Street, Wigan, whose death occurred on January 15th, in his forty-first year, was mains engineer with Wigan Corporation, and had been in the service of the Electricity Department for twenty-seven years.

Sir George Hunter.—The death occurred on January 21st, at Newcastle, at the age of ninety-one, of Sir George Burton Hunter, formerly chairman of Swan, Hunter & Wigham Richardson, shipbuilders, and a director of the North-Eastern Electric Supply Co., Ltd.

Mr. A. Dobrée.—The death occurred on January 26th at Le Fainel, St. Martin's, Guernsey, at the age of seventy-two, of Mr. Alfred Dobrée, C.B.E., who received his early engineering experience with Siemens & Co., and spent two years at sea in an Atlantic telegraph cable ship. In 1910 he became a member of a firm of consulting engineers, of Victoria Street, from which he retired in 1924 to live in Guernsey.

Will.—Mr. James Douglas Dallas, M.I.E.E., late of the County of London Electric Supply Co., Ltd., left £27,096, with net personalty £26,052. He left £50 to the Institution of Electrical Engineers' Benevolent Fund.

In the Courts

A Works Power House Accident

A King's Bench Divisional Court, consisting of the Lord Chief Justice and Justices Swift and Goddard, on January 20th heard the case of Turner *v.* Courtaulds, Ltd., on the appeal of Mr. Turner, a factory inspector, from a decision of the Coventry Justices dismissing an information preferred by the appellant against Messrs. Courtaulds for failure to secure electrical machinery, as a consequence of which a man was killed by electric shock.

Mr. Valentine Holmes, in support of the appeal, said that Messrs. Courtaulds generated their own electricity, and they engaged the British Thomson-Houston Co., Ltd., to extend the switchgear. In April last year the new switch compartment was sought to be used for the first time, and when Messrs. Courtaulds' man tried it it was found to require a little adjustment. Thereupon one of the British Thomson-Houston Co.'s men was asked to put it right and he opened the compartment, and by some means his hand came into contact with a live part of the apparatus and he was thereby killed.

Messrs. Courtaulds were then charged under the Factory and Workshops' Act by the inspector (the appellant) for not making secure that part of the switchboard, the inspector contending that Messrs. Courtaulds, being the "occupiers" of the power house, were liable.

On behalf of Messrs. Courtaulds, however, it was contended that in the circumstances the British Thomson-Houston Co. were at the time of the accident the "occupiers" of that particular section as they had not finished their work and handed it over. The Coventry Justices accepted this submission and dismissed the information.

Mr. Holmes now contended, on behalf of the inspector, that the decision of the Justices was wrong and that the case should be remitted to the Justices with that direction. Mr. Van Den Berg, K.C., on behalf of Courtaulds, supported the Justices' decision. He said that there was no evidence given for the purpose of showing that the Justices had gone wrong on the facts.

At the conclusion of the arguments the Court allowed the appeal, with costs. The Lord Chief Justice, in giving judgment, said it had been found as a fact by the Justices that Messrs. Courtaulds were the owners of the factory in which there was a power house. That was a vital part of the factory in which additional work had to be done. The Justices had allowed themselves to be persuaded that Messrs. Courtaulds were not the "occupiers" of that particular section at the time of the accident. It had to be remembered that the compartment in question was part of the whole control of the electrical current from Messrs. Courtaulds' own power station, and they could not, in his opinion, get out of the liability imposed by the regulations made under the Acts. The other members of the Court concurred, and the case was remitted to the Justices with the direction indicated by the Court.

Universal Lamp Co., Ltd.

In the Companies Court on January 25th Mr. Justice Clauson had before him a petition for the compulsory winding-up of the Universal Lamp Co., Ltd., Great Eastern Street, London, E.C., the petitioners being Thorn Electrical Industries, Ltd., Judd Street, King's Cross, W.C.

When the case was called on counsel for the Universal Lamp Co. asked for an adjournment of the hearing of the petition to allow the company to put forward a scheme of arrangement. This was eventually agreed to, and the hearing of the petition was adjourned for a fortnight.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Booker & Tarran, Ltd.—Private company. Registered January 21st. Capital, £10,000. Objects: To carry on the business of mechanical, electrical and general engineers, manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, &c. The directors are: M. S. Tarran, 48, Ormonde Avenue, Hull, K. W. Tarran, 50, Claremont Avenue, Hull, and R. S. Bamber, Ferndown, Westella Road, Kirkella (director of Tarran Industries, Ltd.). Secretary: Kenneth W. Tarran. Registered office: 16a, Waltham Street, Hull.

Humphrey & Butler, Ltd.—Private company. Registered January 21st. Capital, £500. Objects: To carry on the business of dealers in, importers, exporters or manufacturers of lighting and other fittings and accessories, metal, china, wooden and other goods or material, electricians, electrical contractors, &c. The directors are: J. H. Swanser (managing director), Narkover, Greenway, Totteridge, N.20, and T. W. Butler, 3, Blythswood Road, Crouch Hill, N.4. Registered office: 338a, Regents Park Road, Finchley, N.3.

Fancytas, Ltd.—Private company. Registered January 16th. Capital, £500. Objects: To carry on the business of manufacturers of, agents for and dealers in all kinds of electrical, electro-medical and scientific apparatus, instruments, &c. The subscribers are: H. Gradenwitz, 68, Warwick Road, S.W.5; and H. W. Eley, 108, Palace Road, Tulse Hill, S.W. H. Gradenwitz is a permanent director.

Camberley Radio Supplies, Ltd.—Private company. Registered January 14th. Capital, £500. Objects: To carry on business as manufacturers of and dealers in radio and television instruments, sets, components and accessories, &c. The subscribers are: C. G. Paine, radio dealer, and Mrs. Dora E. Paine, both of "Argus," Station Road, Frimley, Surrey. C. G. Paine is permanent governing director. Secretary: N. C. Walton. Registered office: 40a, Station Road, Camberley, Surrey.

Engineering & Allied Manufacturing Co., Ltd.—Private company. Registered January 16th. Capital, £300. Objects: To acquire the business of factors in radio and electrical supplies carried on by A. Wheeler, F. G. Cooke, L. F. Moore and S. B. Davenport at 317, Lee High Road, Lee, S.E.12. The directors are: A. Wheeler, 317, Lee High Road, Lee, S.E.12 (director of Coil Equipment Co., Ltd.), and three others. Secretary: L. F. Moore. Registered office: 317, Lee High Road, Lee, S.E.12.

Browning Wireless Manufacturers, Ltd.—Private company. Registered January 19th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in wireless, telephone and telegraphic apparatus, &c. The directors are: H. Brown, 18, Shellgrove Road, Stoke Newington, N.16; and V. Taylor, 16, Stainsby Road, E.14. Registered office; 18, Shellgrove Road, Stoke Newington, N.16.

S.C.D., Ltd.—Private company. Registered January 20th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in photographic, television, radio, and electrical apparatus, &c. The directors are: B. J. Della Gana, 176, Holland Park Avenue, W.11; and J. M. Friedlander, 17, Pembridge Villas, W.11. Registered office: 34-40, Ludgate Hill, E.C.4.

Savoy Refrigerator and Manufacturing Co., Ltd.—Private company. Registered January 23rd. Capital, £5,000. Objects: To carry on the business of manufacturers, dealers, agents, importers and exporters of refrigerators, radio and television instruments and apparatus and appliances connected therewith, &c. The permanent directors are: J. Halstead, "The Hollies," Crow Oaks, Whitefield; H. Halstead, "Beechfield," Hollinhurst Road, Radcliffe; and W. Barr, 8, Balnacraig Avenue, N.W.10 (director of Dulci Electrical Co., Ltd.). Registered office: Devonshire Works, Duke's Avenue, Chiswick, W.4.

Returns of Electrical Companies

Ferranti, Ltd.—Capital, 900,000 in 800,000 ordinary shares of 10s. and 500,000 7 per cent. cumulative preference shares of £1. Return dated November 11th, 1936. 600,000 ordinary and 500,000 preference shares taken up. £353,834 paid on 353,834 preference shares. £446,166 considered as paid on the remainder. Mortgages and charges, nil.

Bolton Electrical Traders, Ltd.—Debenture charged on all contracts for the hiring of goods and all contracts for easy payment, deferred payment or payment by instalment dated January 11th, 1937, to secure all moneys due or to become due from the company to Banking Facilities Trust, Ltd., Bowmaker House, Lansdowne, Bournemouth.

Syd Davis (West Bromwich), Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated January 12th, 1937, to secure £500. Holder: S. Davis, "Castlemain," Bustleholme Lane, West Bromwich.

H. H. Ridley & Co., Ltd.—Agreement of further charge dated January 6th, 1937, to secure £300 on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. E. H. Beavan, 21, Lawn Crescent, Kew Gardens.

J. E. Kavanagh (Birmingham), Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated January 12th, 1937, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd. (By deed dated January 11th, 1937, the above debenture ranks in priority to two debentures issued for £3,750 and £1,000 respectively.)

A.R.C. Motors, Ltd.—(a) First mortgage on l[illegible] and two messuages known as "Marylands" a[illegible] Seal Road, Sevenoaks, dated December 8th, [illegible] secure £1,800; and (b) second charge on above property dated December 9th, 1936, to secure £500. Holders: Rev. G. F. Staines, St. Paul's Vicarage, Stoke, Devonport, and C. W. Collier, J.P., Brampton, Southborough, Kent.

Hewittic Electric Co., Ltd.—Capital, £50,000 in £1 shares. Return dated August 11th (filed September 11th), 1936. 40,000 shares taken up. £40,000 paid. Mortgages and charges, nil.

Cablon, Ltd.—Capital, £2,000 in £1 shares. Return dated November 11th, 1936. All shares taken up. £1,250 15s. paid (£1 on 2 and 12s. 6d. on 1,998 shares). Mortgages and charges, nil.

C. J. Plucknett & Co., Ltd.—Capital, £20,000 in £1 shares. Return dated September 14th, 1936. 15,007 shares taken up. £7 paid. £15,000 considered as paid. Mortgages and charges, £3,000.

Power & Traction Finance Co., Ltd.—Capital, £250,000 in £1 shares. Return dated December 31st, 1936. 6,002 shares taken up. £6,002 paid. Mortgages and charges, nil.

E. T. Turner, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital (subject to prior debenture), dated January 2nd, 1937, to secure £650. Holder: Albert E. Blackwell, Strand Lodge, Beaconsfield Road, Epsom Downs, Surrey.

Wm. G. Walter (Bath), Ltd.—Charge on 39 and 40, James Street West, Bath, dated January 1st, 1937, to secure £2,300. Holders: Lloyds Bank, Ltd., 71, Lombard Street, E.C., and Robt. E. D. Wheeler, Swinbrook Manor, Burford, Oxon.

H. O. Electrical Manufacturing Co., Ltd.—J. A. Youels, C.A., of 70a, Basinghall Street, E.C., was appointed receiver and manager on January 14th, 1937, under powers contained in debenture dated November 24th, 1936.

Permaheat Safety Cushion Co., Ltd.—C. H. Mellor, of 180/182, Corn Exchange Buildings, Fennel Street, Manchester, ceased to act as receiver on December 28th, 1936.

C. P. Roots, Ltd.—H. J. Kemp, accountant, of 35, Bank Street, Ashford, Kent, was appointed receiver and manager on January 14th, 1937, under powers contained in debenture dated August 10th, 1936.

Magna Wire & Cable Co., Ltd.—Capital, £11,000 in 10,000 preference shares of £1 and 20,000 ordinary shares of 1s. Return dated November 30th, 1936. 2,027 preference and 11,500 ordinary shares taken up. £2,027 paid on the preference shares. £575 considered as paid on the ordinary shares. Mortgages and charges, nil.

Holophane, Ltd.—Capital, £100,000 in £1 shares. Return dated October 14th, 1936. All shares taken up. £7 paid. £99,993 considered as paid. Mortgages and charges, nil.

Electricity Services, Ltd.—Capital, £5,000 in £1 shares. Return dated December 9th, 1936. 4,575 shares taken up. £4,515 paid. £60 considered as paid. Mortgages and charges, nil.

Tel-a-lite & Accessories, Ltd.—Capital, £500 in £1 shares. Return dated October 26th, 1936. All shares taken up. £467 paid. £33 considered as paid. Mortgages and charges, nil.

Read & Morris, Ltd.—Capital, £2,000 in 1,200 shares of 1s. and 1,940 shares of £1. Return dated August 24th (filed September 5th), 1936. 1,200 1s. shares taken up. £30 paid. £30 considered as paid. Mortgages and charges, nil.

City Notes

International Combustion, Ltd., held its annual meeting on January 20th when Mr. G. R. T. Taylor (chairman), who presided, referred to the record volume of work on hand. He said that during the past two years they had executed contracts for boilers and steam-raising equipment at the Corporation electric power stations in Birmingham (Hams Hall), Leicester, Leeds and Nottingham. They had in progress repeat contracts for the first three of these stations as well as additional contracts for the Derby Corporation, Government of Western Australia, West Midlands J.E.A., Rotherham Corporation, Beardmore & Co., and smaller orders embracing similar equipment and other products. The Derby works were fully employed and new machinery was constantly being installed to reduce costs and help cope with the extra work. With regard to the future demand for additional power station plant it was probable that there would be a lull, at least in the construction of new stations and extension of existing ones, and in the face of this it was necessary to increase the export side of the business. They were endeavouring to expand business from their subsidiary companies in South Africa and Australia, while in India they had formed a local subsidiary company to take charge of their interests. They would continue this policy in other countries as circumstances merited. The business of Riley Stoker Co., a subsidiary, continued to expand, the sales increasing by one-third in the past twelve months. Mr. G. C. Usher (managing director) said that the sales effected for the current financial year exceeded the total for the whole of the previous twelve months. There was little abatement in the activities of the home boiler market, and they had every prospect of securing their share of this work. The demand for boiler plant overseas was rising rapidly, and during January they had secured orders for plant for the new steel works to be erected for the Turkish Government and further boilers for the Congella, Durban, plant of the South African Electricity Commission. These two orders totalled nearly £200,000. The grinding, screening and filtering section of their business gave them a large interest in gold and general mining, paper making, chemical production, quarrying, &c., and practically all mines throughout the world contained some of their equipment. They were also at the present time supplying mills, screens or filters for most of the dominions and colonies, Yugoslavia, Japan and South America.

The Kalgoorlie Electric Power & Lighting Corporation.—A meeting will be held on February 18th at which proposals will be considered for increasing the capital from £125,000 to £200,000 [illegible] of 150,000 ordinary shares of 10s. each. It is [illegible] 125,000 shares at par to existing shareholders in the proportion of one new share for every two shares held. Arrangements have been concluded by two of the company's largest consumers, under which those consumers will contract for a period of five years to take from the Corporation the whole of the electrical power they require at an agreed price. In consequence, it has become necessary to increase the capacity of the plant, and the issue is to be made to provide the cost of the additional plant. A resolution is also included providing for the sub-division of the five preference shares of £1, issued in connection with the income debenture stock into shares of 10s. each, ranking *pari passu* with the existing ordinary shares.

Murex, Ltd.—At a meeting held on January 25th resolutions were passed increasing the capital to £1,250,000 by the creation of 600,000 new ordinary shares of £1 each and issuing 400,000 fully paid shares as a bonus on the basis of two shares for every three held.

The Melbourne Electric Supply Co., in its report for the year ended August 31st last, shows an income of £66,750, as compared with £100,853 in the preceding year. After deducting administration expenses and interest there is a balance of £52,304, to which is added £845 brought in, making £53,149 available. The final dividend on the consolidated ordinary stock is 1½ per cent., making 3½ per cent. for the year, free of British tax (against 4 per cent.), and £920 is carried forward. During the year the company paid off the last outstanding debentures totalling £700,000. In December, 1935, the Court sanctioned the reduction of the shart capital by the paying off of 100,000 8 per cent. cumulative preference shares of £5 each at a premium of 5 per cent., thus necessitating the provision in London of £525,000 in English currency. This debt has been gradually reduced by the sale of a portion of the company's holdings of Commonwealth Government stock until at the date of the balance sheet the amount outstanding was £200,000. Further, during the year several of the high interest-bearing investments of its subsidiary were paid off.

The Westinghouse Brake & Signal Co. reports a net profit for the year ended September 30th last of £260,765, as compared with £175,456 in the preceding year, which with £42,667 brought in makes £303,432. Reserve receives £70,000, and the pensions fund £45,000. The dividend for the year is maintained at 10 per cent., but there is an extra cash bonus of 5 per cent., making a total distribution of 15 per cent. The amount carried forward is £60,061. Meeting: February 9th.

The Rheostatic Co., Ltd.—It is reported that 100,000 6 per cent. cumulative preference shares of 10s. each and 350,000 ordinary shares of 4s. each will shortly be introduced to the market. This company carries on the business of electrical engineers, and specialises in the manufacture of thermostats and all types of instruments for the control of heat.

Joseph Lucas, Ltd., has announced interim dividends for the year to August 31st of 6d. per share on the "A" preference shares (same) and 7.2d. on the "B" preference shares (same), both subject to tax.

The City of Buenos Aires Tramways (1904) has announced a final dividend of 1s. 3d., making 5 per cent., less tax, for 1936 (same).

The Yorkshire Electric Power Co. is paying a final dividend on the ordinary stock of 5 per cent. (same), making 8 per cent., less tax, for the year (unchanged).

The Anglo-American Telegraph Co. has declared the first and final dividend of 1½ per cent., less tax, on the deferred shares for the year (same).

Bath Electric Tramways, Ltd., is to redeem the whole of its outstanding £101,745 4½ per cent. first mortgage debenture stock on July 31st next at 105 per cent.

Bennis Combustion, Ltd., is paying an interim ordinary dividend of 5 per cent., less tax (same).

Stocks and Shares

STOCK Exchange conditions are not such, at the present moment, as flatter the investor in gilt-edged securities. For various reasons, none of them very new, the prices of the best-class stocks have given way in most departments of the Stock Exchange. For the moment, at any rate, investment is acting cautiously in the absorption of gilt-edged issues. The argument is constantly heard that prices have been standing for some time past at a very high level, and that, sooner or later, they are bound to be dislodged owing to the increasing demands made by trade and industry upon capital.

Government intentions for meeting expenditure on national re-armament cast a shadow over business in the gilt-edged market. Whatever the means eventually chosen by the Treasury, they are likely to be little to the taste of holders of fixed-interest securities. The price-decline brought about by apprehension on this score has raised anew the whole question of the future course of interest-rates, discussion of which shows that the possibility of a sustained rise is considered with sufficient seriousness to provoke suggestions as to whether it could or should be prevented. The terms of the recent issue of a second block of London Electric Transport Finance stock served to underline the extent to which this tendency has already risen. The price of 97, at which the original issue was made, contrasts with the figure of 92½ at which it was possible to offer, eighteen months later, a further line of the identical stock. Few people, however, expect to see the downward movement in prices carried far at present. Support is looked for in the heavy weight of money awaiting investment in stocks of the safety-first class.

Cable and Wireless Stocks Rise

Interest in Cable and Wireless stocks has been wide awake since publication of the promising November traffic index number. Activity quickened with the imminence of the December figure, and developed into quite a burst of strength when the result, the best achieved in any month since the inauguration of the index at the beginning of 1930, became known. While not forgetting that exceptional factors helped during the last two months of 1936 to swell the normal traffics, people are ready to read the figures as an earnest of the beginning of a sustained up-swing. The price of the preference stock, which has risen since the beginning of the year from 101 to 107½, includes arrears of dividends since March, 1934, to which date the dividend was made good by last year's distribution of 5½ per cent. There seems to be no obstacle to the payment this year of another full year's dividend plus, perhaps, some contribution towards reduction of the arrears. The ordinary stocks are being bought by long-sighted speculators and by those people who give ear to persistent talk of pending financial develop-

ments. At the current prices of 23½ and 7⅛ the "A" and "B" ordinary stocks have appreciated by 3 and ⅝ respectively in the last month.

Marconi Marines

Present activity in shipping shares is prominent against the rather drab background of industrial markets generally. The strength of the group is, of course, due to a growth of confidence in the promotion of freer international trade. Buying of Marconi International Marines is a natural corollary to optimism in shipping circles, where the company looks for the greater part of its business. The price of Marconi Marines recently crossed £2 for the first time in many months. At to-day's price of 41s. 3d. the yield on the shares works out at £3 12s. 9d. on the basis of last year's distribution of 7½ per cent. Assuming fulfilment of forecasts of a 10 per cent. dividend for the present year, the yield would be raised to £4 17s. per cent. Predictions of a dividend increase do not rely solely on higher profits from expansion in normal trading; this year's accounts will reflect also the annual saving of £15,000 calculated to accrue from recent economies in administrative organisation. An addition of £15,000 to revenue would represent approximately 1¼ per cent. on the ordinary capital.

Electrical Equipment Shares

As a group, electrical equipment and manufacturing shares continue to receive, at the present time, a more confident support than do many industrial equities. There are various reasons for their being particularly singled out, in addition to the prospect of big orders in connection with the planned heavy expenditure on railway construction and electrification. Belief prevails that the industry has greater scope for expansion in the home field than have certain other branches of industry which may possibly have reached, or even passed, the peak of their activity. At the same time, any betterment in overseas trading conditions would be as welcome to electrical equipment manufacturers as to most other industrialists. Prices in the market have moved, during the week, generally upward. The newcomer, Crabtree Electrical, continues as the centre of lively dealings at rising prices. The idea that an interim dividend might be declared at the present stage, has helped to advance the price further, from 34s. 9d. to 36s. Of the senior issues, Associated Electrical are outstanding, with a rise of 1s. 6d. to 53s. Callenders make the best showing in the cable group. Henleys reacted to 22s. 6d. Henleys preference, now £1 shares, have dropped to 25s. This still looks well by comparison with 115s., at which the £5 shares stood before sub-division. Crompton Parkinsons, after an uneven display, are finally unchanged, on the week, at 75s.

Consolidated Signal

Total assets of the Consolidated Signal Company comprise a holding of £391,112 ordinary stock of Westinghouse Brake and Signal. It is reckoned that every 1 per cent. received in dividends from the operating company is equivalent to slightly over 2½ per cent. on the holding concern's ordinary capital. Westinghouse Brakes have declared a dividend of 15 per cent. this year, so that the market estimate of a 30 per cent. dividend on Consolidated Signal is fairly certain to be close to the mark. The announcement is due very shortly. Last year, the distribution was only 7 per cent., but was paid out of earnings, a large proportion of which was appropriated in payment of preference dividend arrears, equivalent to 17 per cent. on the ordinary stock. The present price of 142s. 6d. for the £1 units would give, on a 30 per cent. dividend, a yield of £4 4s. 3d. per cent. On the operating company's shares, standing at 76s., ex dividend, the return is a little under 4 per cent. on the money.

Benevolent Fund Investments

Substantial holdings of London Electric Transport 2½ per cent. guaranteed debentures, London and Home Counties 3¼ per cent. stock, London Power 3½ per cent. debenture, and Railway Finance Corporation guaranteed debenture, appear in the annual report of the Stock Exchange Benevolent Fund. That report has just been issued. It shows that out of the total amount of investments belonging to the Fund—nearly £374,000 in all—a good proportion is in the stocks of companies closely connected with the electrical industry. The Fund is administered by Stock Exchange members, whose knowledge of investment, as a science, is considerable.

Miscellaneous Matters

Prices in the market for home electricity supply shares remain unperturbed by weakness in the gilt-edged and other markets. The foreign section is enlivened by activity in Perak Hydros, which, at 33s., are a good market on the possibility of an offer of scrip being made, on bonus terms, to meet costs of expansion. The latter contingency is the reason given for an increase in the capital of the Kalgoorlie Electric Company, which is offering shareholders new shares, on a one-in-two basis, at par. With the old shares quoted at 14s. 3d., rights to the new issue represent approximately 1s. 5d. per share.

The disastrous floods in the United States have led to sales of shares in American utility companies whose properties lie within the devastated areas. Brazilian Tractions are a point up at 22½. The iron and steel market is inclined to droop: Babcock & Wilcox shares are 2s. 9d. lower at 51s. 3d. Rubber keeps above 10d. per lb., but the share market has lost attraction for the time being.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Jan. 26.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	38/–	—	3 19 0
Clyde Valley	1	7	8	45/6	—	3 9 7
County of London...	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	35/6	—	3 18 9
Do. Ord.	1	8	8	44/6	—	3 12 0
Elec. Dis. Yorkshire	1	9	9	45/6	—	3 19 0
Elec. Fin. and Securities	1	12½	12½	3 1/16	—	4 1 7
Elec. Supply Corporation ...	1	11	11	58/3	—	3 15 7
Lancs Light and Power	1	7½	7½	38/–	—	3 19 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	40/–	—	4 0 0
London Power Deb. Red. ...	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	50/6	—	3 19 2
Midland Counties	1	7	7½	40/6	—	3 14 0
Mid. Elec. Power	1	8	8	42/6	—	3 15 3
North Eastern Electric Ordinary	1	6	6	33/6	+6d.	3 11 10
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary ...	1	10	10	55/6	−6d.	3 12 0
Do. do. 6% Pref. ...	1	6	6	31/6	—	3 16 2
Scottish Power	1	8	8	42/–	—	3 16 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	—	6 10 4
Yorkshire Elec.	1	8	8	45/–	—	3 11 0
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	118½	−½	4 4 5
Do. 1955–75 ...	,,	5	5	121	−½	4 2 4
Do. 1951–73 ...	,,	4½	4½	113	—	3 19 8
Do. 1963–93 ...	,,	—	3½	102	−1	3 8 8
London Elec. Trans. Gtd. ...	,,	—	2½	91	—	2 14 9
London & Home Counties, 1955–75	,,	4½	4½	114	—	3 19 0
London Passenger Transport, A...	,,	—	4½	121½	+½	3 14 0
Do. do. B...	,,	—	5	122½	−1	4 1 9
Do. do C...	,,	3½	4	97	+1	4 2 6
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	187½	—	4 16 0
Anglo-Am. Tel. Pref.	Stock	6	6	129½	—	4 12 8
Do. Def.	,,	1½	1½	32½	—	4 12 4
Cable & Wireless 5½% Pref. ...	,,	4½	5½	107½	+2½	5 2 4
Do. A. 7½% Ord.	,,	Nil	Nil	23½	—	—
Do. B. Ord.	,,	Nil	Nil	7½	+½	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½	+⅜	3 2 1
Do. Do. Pref.	10	6	6	14½	+⅜	4 2 9
Great Northern Tel.	10	20	20	46	−½	4 6 0
Marconi-Marine	1	10	7½	2 1/16	—	3 12 9
Oriental Telephone Ord.	1	12*	12*	3 1/16	—	3 12 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	5/9	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	−1/16	—
Do. do. 5% Deb.	Stock	Nil	Nil	27½	—	—
British Electric Traction Df. Ord.	,,	5	5	1575	—	—
Do. do. Pref. Ord.	,,	8	8	172½	−3	4 12 9
Brazil Traction	100	—	70 cts.	22½	+1	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105½	+1	4 14 9
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds...	$500	5	5	47	—	—
Victoria Falls Ord	1	20	12	76/3	—	3 3 2
West Riding	1	5	6½	47/6	—	2 14 8
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	3	—	5 0 0
Assoc. Elec. Ord.	1	6	8	53/–	+1/6	3 0 4
Do. Pref.	1	8	8	39/–	−6d.	4 2 0
Babcock & Wilcox	1	8	8	51/3	−2/9	3 2 5
British Aluminium Ord.	1	7½	7½	44/6	−6d.	3 7 8
British Insulated Ord.	1	15	20	6½	+1/16	3 0 6
Brush Ord....	Stock	Nil	Nil	37½	—	—
Callender's	1	15	15	4 1/16	+1/16	3 2 4
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/–	12½	12½	75/–	—	—
Do. 8% Pref.	1	8	8	37/6	−1/16	4 5 4
Electric Construction	1	3½	7	42/6	—	3 5 9
Enfield Cable Ord.	1	25	25	5½	—	4 17 0
English Electric	1	Nil	Nil	32/–	—	—
Do. Do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/–	24	20*	58/9	+1/16	1 14 0
Ever Ready	5/–	35	35	32/6	+6d.	5 7 8
Ferranti Pref.	1	7	7	26/3	−⅛	5 6 8
G.E.C. Pref.	1	6½	6½	31/3	−1/9	4 3 2
Do. Ord.	1	10	15	91/6	−6d.	3 5 10
Henleys	5/–	30	30	22/6	−6d.	3 6 8
Do. 4½% Pref.	1	4½	4½	1½	−¼	3 12 0
India-Rubber Pref.	1	1⅜	5½	23/3	—	4 17 9
Johnson & Phillips	1	7½	10	53/3	—	3 15 2
Lancashire Dynamo	1	5	10	3 1/16	—	2 16 2
Siemens Ord.	1	4	6	33/9	—	3 11 0
Telegraph Construction	£1	Nil	Nil	33/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

9314. "Circuits containing cathode-ray oscillographs." R. A. W. Watt. March 26th, 1935. (459041.)

9613. "Television and kinematography." H. Vierl. March 27th, 1934. (Cognate application 9614/35.) (459042.)

9755. "Electric power transmission." A. M. Taylor. March 29th, 1935. (Cognate applications 17340/35 and 25409/35.) (459121.)

14004. "Television mirror drums or wheels." J. Bell and W. S. Worthington April 8th, 1936. (458923.)

13455. "Thermionic-valve systems." Baird Television, Ltd., G. W. White, A. J. Brown and P. W. Willans. May 27th, 1935. (458861.)

15904. "Electricity meters incorporating synchronous electric motors." Measurement, Ltd., and C. F. Clifford (F. Holden in part). May 31st, 1935. (459047.)

15997. "Method and apparatus for the manufacture of electrodes for arc welding, or similar articles formed by coating a longitudinal core with plastic material." R. Sarazin. June 2nd, 1934. (Cognate application 15998/35.) (459132.)

18045. "System of automatic train control for railways and the like." K. H. Greenly and H. Greenly. June 24th, 1935. (459133.)

18063. "Explosion pot electric switches." General Electric Co., Ltd., and C. C. Garrard. June 24th, 1935. (459049.)

18269. "Ward Leonard and like electrical systems." English Electric Co., Ltd., and J. C. Wilson. June 26th, 1935. (459052.)

18335. "Television receiving systems." British Thomson-Houston Co., Ltd., T. H. Kinman and D. S. Watson. June 26th, 1935. (459070.)

18361. "Multi-range superheterodyne receiver." E. K. Cole, Ltd., and H. C. Rowe, jun. June 27th, 1935. (459072.)

18625. "Electric-discharge apparatus." W. Lehmann. June 28th, 1934. (Cognate applications, 18626/35 and 18627/35.) (459055.)

18711. "Radio receiver with automatic selectivity control." E. K. Cole, Ltd., G. Bradfield and F.A. Inskip. July 1st, 1935. (459209.)

18721. "Lighting dynamos." R. Bosch Akt.-Ges. July 3rd, 1934. (459140.)

18794. "Electric water-heater." W. Stubbs. July 1st, 1935. (459148.)

18971. "Electrodes of electric-discharge tubes." W. L. W. Schallreuter. July 3rd, 1935. (Cognate application 18972/35.) (459163.)

19057. "Centrifugal electric switches." British Thomson-Houston Co., Ltd., and J. R. Tole. July 3rd, 1935. (459169.)

19071. "Light-polarising devices." P. V. Reveley and Baird Television, Ltd. July 3rd, 1935. (459171.)

19121. "Television and like systems." J. L. Baird and Baird Television, Ltd. July 4th, 1935. (459177.)

19122. "Television and like systems." J. C. Wilson and Baird Television, Ltd. July 4th, 1935. (459178.)

19161. "Determination electrically of the temperature and oxygen and carbon dioxide content of gases." A. J. M. Smith and R. Gane. July 4th, 1935. (459181.)

19263. "Electric battery terminal connectors." T. Clausen and E. Schmidt. July 5th, 1935. (458931.)

19917. "Controlling systems for lifts.' General Electric Co., Ltd., and A. A. Chubb. April 14th, 1936. (458988.)

20470. "Tapping devices for live electric conductors." A. West & Co., Ltd., and G. L. Hancock. July 18th, 1935. (458934.)

21080. "Combined heating and lighting electric fittings." G. E. Bailey and Metropolitan-Vickers Electrical Co., Ltd. July 24th, 1935. (459192.)

23837. "Devices for indicating or signalling the load limits of cables." G. B. Canale. August 26th, 1935. (458942.)

24189. "Operators' sets for telephone systems." Telephone Manufacturing Co., Ltd., J. G. Flint and L. E. Ryall. August 29th, 1935. (459198.)

24571. "Electric light fittings." General Electric Co., Ltd., and W. R. Stevens. September 3rd, 1935. (458943.)

25054. "Electrically operated devices applicable for display, advertisement, amusement or the like." C. Tregoning. September 9th, 1935. (458997.)

29511. "Time-base circuits for cathode-ray tubes." General Electric Co., Ltd., R. J. Dippy and D. C. Espley. October 25th, 1935. (458878.)

30223. "Electric circuits comprising thermionic valves with indirectly heated cathodes." General Electric Co., Ltd., G. W. Edwards and D. C. Espley. November 1st, 1935. (458879.)

30366. "Röntgen-ray apparatus." Electricitäts-Ges. Sanitas. November 3rd, 1934. (Cognate applications 30367/35, 30369/35, 30370/35, 30371/35 and 30375/35.) (458880.)

32022. "Electrical resistances." H. P. Huhne. November 19th, 1935. (459063.)

32409. "Generation of synchronising signals for television and the like." General Electric Co., Ltd., and D. C. Espley. November 22nd, 1935. (458883.)

33820. "Electrical flat bar heating elements for fireplaces, ovens, stoves and the like." Elektro-Geratebau Ges. December 7th, 1934. (459067.)

34105. "Screened grid valves." J. M. Dodds, J. H. Ludlow and Metropolitan-Vickers Electrical Co., Ltd. December 9th, 1935. (Addition to 414753.) (458954.)

34453. "Electric cables." Callender's Cable & Construction Co., Ltd., F. K. Callender and E. G. Gillman. December 12th, 1935. (458957.)

1936

4548. "Electrodes for high-pressure metallic-vapour electric-discharge tubes. W. J. Tennant. (Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz & Silva.) February 14th, 1936. (Addition to 450035.) (459204.)

8632. "Dry electric rectifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 1st, 1935. (458889.)

11078. "High-pressure metal-vapour electric devices." British Thomson-Houston Co., Ltd., and the General Electric Co., Ltd. July 3rd, 1935. (458896.)

11765. "Diaphragms for use with Röntgen-ray apparatus." Siemens Reiniger-Werke Akt.-Ges. June 8th, 1935. (459012.)

11807. "Device for controlling variable and adjustable condensers." Blemer Soc. A.R.L. May 2nd, 1935. (459013.)

13282. "Thermostatic electric switches." R. V. Grover and Drayton Regulator & Instrument Co., Ltd. May 11th, 1936. (458900.)

13817. "Electrically controlled spring-driven clocks." Fabrik Elektr. Apparate F. Sauter Akt.-Ges. May 18th, 1935. (459102.)

14913. "Traffic signalling apparatus applicable to roads." J. J. Phelan. May 27th, 1936. (458902.)

15562. "Means for fixing grids in the anode protecting tubes of metal vapour convertors." Siemens-Schuckertwerke Akt.-Ges. June 3rd, 1935. (Addition to 367648.) (459028.)

19193. "Frequency-regulating systems." British Thomson-Houston Co., Ltd. July 12th, 1935. (459031.)

19396. "Electro-magnetic track brakes." Knorr-Bremse Akt.-Ges. August 7th, 1935. (458911.)

19878. "Mercury-vapour rectifiers or similar electrical discharge apparatus." British Thomson-Houston Co., Ltd. July 19th, 1935. (459161.)

20453. "Electric-discharge devices. British Thomson-Houston Co., Ltd. July 25th, 1935. (459114.)

20473. "Printing-telegraphs." Siemens & Halske Akt.-Ges. August 23rd, 1935. (459034.)

20782. "Magnetic sound recording and/or reproducing apparatus." British Thomson-Houston Co., Ltd. July 26th, 1935. (459035.)

24531. "Electro-magnetic relays operated at a low potential." Vereinigte Eisenbahn-Signalwerke Ges. September 16th, 1935. (Addition to 448549.) (458918.)

29058. "Electric-discharge devices." British Thomson-Houston Co., Ltd. October 25th, 1935. (459038.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 20th :—

Listard. No. 572974. Class 6. Machinery of all kinds. No. 572976. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—R. A. Lister & Co., Ltd., Victoria Ironworks, Dursley, Glos.

Marathon (lettering and design). No. 571665. Class 8. Measuring instruments and magnets (not for curative purposes).—Deutsche Edelmetallwerke Gesellschaft, Krefeld, Germany (British representatives, Hyde & Heide, 2, Broad Street Buildings, Liverpool Street, E.C.2).

OEC (lettering and design). No. 571443. Class 13. Metal goods.—The Ormond Engineering Co., Ltd., Ormond House, Rosebery Avenue, E.C.1.

Ate (lettering and design). No. 569138. Class 18. Refrigerating chambers and air-treating installations.—Alfred Teves Maschinen und Armaturen Fabrik, Frankfort-am-Main, Germany (British representatives, Tench & Meyer, 20-23, Holborn, E.C.1).

Faradite. No. 572438. Class 50. Electric lighting fittings made of synthetic resin.—Osler & Faraday, Ltd., Lanthorne House, 89-91, Newman Street, Oxford Street, W.1.

Steels for Superheaters

THE production of steel for radiant-heat superheater construction, especially for those with tubular elements, has presented a difficult problem to the metallurgist, but there is little doubt that suitable steels are now available which will satisfactorily meet the majority of cases. Where long life is required, the general opinion is that the tubes should be constructed from a non-oxidising steel capable of maintaining a relatively high tensility at elevated temperatures and possessing a high creep rate and good conductivity. The use of high-tensile steel enables thinner tubes to be installed than would normally be possible with standard carbon steels, which, of course, is most important as temperature stresses are reduced with the metal thickness.

While the use of alloy steel is generally advocated where long life is desired, some users contend that for moderate steam temperatures standard carbon steels, in spite of more frequent replacements, can be justified on the score of low initial costs and the small amount of labour entailed by such replacements. By covering the tubular elements with flat-faced blocks, the temperature of the elements is reduced, and except for very high steam temperatures and pressures standard boiler-tube steel is often used.

To ensure the success of this construction a perfect contact between the block and the superheater tube is essential, so that the heat absorbed by the block is readily conducted to the cooling medium. With this construction the most vulnerable part is the block covering by virtue of its being exposed to the furnace gases, although as the steam is contained in tubular elements the blocks themselves have merely to withstand temperature conditions. In the absence of stresses other than those due to temperature, cast iron, on account of its resistance to heat and its cheapness, is used for the manufacture of the blocks, which, for high temperatures, should be suitably alloyed to prevent undue growth.—"ENTROPY."

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (24), New Deer; J. B. Smith, 21, Station Road, Elion.

Addington.—Houses (53), Heathway; Bennett & Worskett, 73, Gower Street, W.C.1.

Atherstone.—Regal Cinema, on the Old Workhouse site, Long Street, for the Regal Atherstone, Ltd.; T. Elvins & Sons, Ltd., builders, Naden works, Soho Hill, Birmingham.

Aylesbury (BUCKINGHAMSHIRE).—Houses (41), California estate; W. H. Taylor, borough surveyor.

Belford (NORTHUMBERLAND).—Houses (20), Beadnell; J. W. Douglas, architect, 27, Bondgate Without, Alnwick.

Belper.—Hosiery factory, near Penn Street; F. Blount, the Wilderness, Allestree, near Derby.

Benfieldside (Co. DURHAM).—Houses (200); U.D.C. surveyor.

Birmingham.—Additions to factory, Bartholomew Street, for Taylor, Ltd.; E. Lancelot Turner, builder, St. Vincent Street.

Bishop Auckland.—Houses (24), Sunnybrow; R.D.C. surveyor.

Blackpool.—Lido, café, and entertainment hall, Promenade, Cleveleys; R. H. Cunliffe, architect, Estate Office, Victoria Road, Cleveleys.

Blaydon (Co. DURHAM).—Sports stadium (£50,000); Arthur and Kirkup, architects, Swinburn Street, Gateshead-on-Tyne.

Bournemouth.—Aerated water factory, Ringwood Road; Reynolds & Tomlins. Extensions to Royal Victoria Hospital; Governors. Extensions to St. Luke's school, for E.C.

Bradford.—School; Petch & Formand, architects, 8, Buckingham Palace Road, London, S.W.1.

Brierley Hill.—Houses, Belle Isle, Tack Farm estates and Enville Road site; U.D.C. surveyor. Houses, Brockmoor, Wordsley, and Wallheath; Housing Ltd., builders.

Brighton.—Cinema, West Street; H. H. Weingott.

Bushbury (NEAR WOLVERHAMPTON).—School, Elston Hall (£42,990); McKeand, Smith & Co., Ltd., builders, Wolverhampton.

Cardiff.—Houses (204), Ely estate, and school (8-acre site), Colchester Avenue; city engineer, City Hall. Two light factories, Treforest trading estate, for the South Wales and Monmouthshire Trading Estates Co., Ltd.; secretary, Principality Buildings, Queen Street.

Carlisle.—Houses, between Wigton Road and Dalston Road, for C.C., and school, Botcherby, for E.C.; city architect.

Caterham.—Houses (37), Ninehams Road; A. Wheal.

Chester.—Extensions to works, Newry Park; Brookhirst Switchgear, Ltd.

Coventry.—Block of shops and flats, Birmingham Road; T. D. Griffiths, architect, The Quadrant. Aircraft works, Baginton; Sir W. G. Armstrong-Whitworth, Ltd. Offices and depôt, London Road, for T. Walls & Son, Ltd.; Wilson & Son, Ltd., builders, Sheep Street, Northampton.

Croydon.—Houses, Wilford Road and Windmill Road areas (£79,600), and extensions to Queen's Road Homes (£45,750), and mental institution, Warlingham (£24,000); borough engineer. Cinema, Bingham Road; H. H. Weingott.

Darlington.—Houses (100) for aged people; borough engineer.

Derby.—Works for W. R. Ellis, Ltd., Shardlow.

Dudley.—Greyhound racing track, Victoria Football Ground, for the Kings' Heath Greyhound Racecourse.

Dumbarton.—Aircraft factory for Blackburn Aircraft (Ltd.), Brough, East Yorkshire; the manager.

Durham.—School of agriculture, Houghall Farm (£57,988), for C.C.; W. Pearson and Sons, builders, Stranton, West Hartlepool. School, Crook (£44,349); county architect.

Edinburgh.—Houses (320), Colinton Mains; Stewart Kaye, architect, 14, Hill Street. Houses, Old Piershill Barracks, Portobello Road; city architect, City Chambers. Cinema, for the Poole's Roxy (Edinburgh), Ltd.; Chadwick, Watson & Co., architects, 9, Albion Street, Leeds.

Exeter.—Baths, Athelstan Road (£41,000), and extensions to transport depôt, Paris Street; city architect. Cinema, Sidwell Street; Odeon Theatre, Ltd.

Fulmer (BUCKINGHAMSHIRE).—Bakery, for H. J. Colebrook.

Gateshead-on-Tyne.—Houses (five-acre site), Split Crow Road; borough engineer.

Gillingham (KENT).—Extensions to Napier Road school; J. L. Redfern, architect.

Glasgow.—Carpet factory, for James Templeton and Co., Fordneuk Street. Factory, Shieldhall Riverside quay, for the Gyproc Products, Ltd., 15, Regent Street, London, S.W.1; manager. School (£60,000), Alice Street; Hutton & Taylor, architects, 5, India Street.

Gloucestershire—School Filton; R. S. Phillips, county architect, Shire Hall, Gloucester.

Gourock.—Hotel, Pierhead (£17,000); manager, Gourock Pierhead Development Co.

Halesowen.—Extensions to factory, for the National Tube Co., Ltd., Prospect Road.

Houghton-le-Spring.—Houses (192); R.D.C. surveyor.

Hull.—Rebuilding secondary school (£64,018); city architect.

Irish Free State.—(CARLOW).—Cottages (241); secretary, Carlow Board of Health, County Home, Carlow. (DUBLIN).—Shops and flats, Townsend Street area (£88,582); Meagher & Hayes, Dublin. (ENNIS).—Houses (157), Hermitage site; M. J. Carmody, town clerk. (ENNISCORTHY, Co. WEXFORD).—School, for Wexford Vocational E.C., County Hall, Wexford; O'Sullivan & Jordan, architects and engineers, 104, Grafton Street, Dublin, C.3. (RATHDOWNEY, Co. LEIX).—School, for the Leix Vocational E.C., Portlaoighise, Co. Leix; Scott & Good, architects, 36, South Frederick Street, Dublin. (WEXFORD).—Houses (62), Whitemill; town clerk.

Kent.—Greyhound track, Crayford and Bexleyheath, for Gosforth Greyhound Stadium Co. (£90,000); W. J. Freer, secretary.

Lanarkshire.—Alterations and additions to East Kilbride school; J. Stewart, county architect, Albert Street, Motherwell.

Langley (BUCKINGHAMSHIRE).—Factory, Station Road, for Foamite, Firefoam, Ltd.

Largs (AYRSHIRE).—Cinema, restaurant, ballroom, &c., Pierhead (£40,000); H. Kemp, Largs.

London.—(CAMBERWELL).—Extensions to works for the Waxed Papers, Ltd., Nunhead Lane. (HENDON).—Technical institute (£92,971); Taylor Woodrow Construction, Ltd. (LEWISHAM).—Premises, 11-23, Belmont Hill, for the Royal Arsenal Co-operative Society; S. W. Ackroyd, architect, Commonwealth Buildings, Albion Road, S.E.18. (ST. MARYLEBONE).—Shops, auction room, &c., Lisson Grove; W. E. Masters, 138, Gloucester Place, N.W.1. Rebuilding premises, Oxford Street; North Robin & Wilsdon, Townsend House, Greycoat Place, S.W.1. (ST. PANCRAS).—Extensions to Camden Town clinic; borough engineer. (WANDSWORTH).—Flats, White Square (£133,052); W. Willett, Ltd., Sloane Square, S.W.1. (WESTMINSTER).—Development of Westminster Hospital site; Laing's Properties, Ltd. Extensions to Hospital for Women, Soho Square; Governors. Rebuilding 127, Oxford Street; H. Tanner, 3, Hanover Square, W.1.

Lowestoft.—Showrooms, London Road; Messrs. Hailey. Alterations to Palace Cinema, London Road; Ferrier & Ferrier.

Luton.—School, Beechwood Road (£28,935), for E.C.

Manchester.—Showroom and workrooms for J. G. Needham, Ltd., 54, Lever Street; W. T. Gunson & Son, architects, 10, Marsden Street, Manchester.

Mansfield.—Houses (133); Waude Thompson, borough surveyor.

Middlesex.—Extensions to Clarendon and Echelford schools, Ashford, for County E.C.

Musselburgh.—Cinema (£25,000), for the Inveresk Cinema Co., Ltd., 7, North St. Andrew Street, Edinburgh; secretary of the Company.

Newbury.—Houses, Cromwell Road; borough engineer. Rebuilding, 84, Northbrook Street; Pass & Co.

Newcastle-under-Lyme.—Swimming bath for High School; Venables & Barker, architects, Gordon Chambers, Cheapside, Hanley, Stoke-on-Trent.

Northampton.—Houses (96), Duston Road; Gale Bros. Houses (42), London Road; Acme Building Co.

North Shields.—Police dwellings, Stephenson Street; Tynemouth borough engineer.

Nottingham.—Houses (304), Beauvale estate, Hucknall; G. Cooper (Nottingham), Ltd., builders, Mapperley Street, Sherwood.

Patcham.—Houses (30), Wilmington Way; C. W. Parkes. Houses (38), Withdean estate; Braybons, Ltd.

Plymouth.—School and institute, Stoke (£78,726) for E.C.

Renfrewshire.—School, Paisley; architect, County Hall, Paisley.

Rochdale.—Extensions to isolation hospital, Littleborough, for the Littleborough, Milnrow and Wardle Joint Committee; A. Travis, architect, Market Chambers, Rochdale.

Rottingdean.—Bungalows (132), shops and flats, Hempstead Road; Saltdean Estate Co., Ltd.

Rubery (WORCESTERSHIRE).—Houses (120), near Worcester Road; S. J. Smith & Co., builders, 70, Newhall Street, Birmingham.

Shipley.—Houses (154), Crag End and Royds estates (£61,653); U.D.C. surveyor. Houses (26), Low Ash Drive; Low Ash Estate Co.

Sittingbourne.—Houses (28), Elm Grove estate; U.D.C. surveyor.

Slough.—Houses (28), Chalvey and Cippenham; U.D.C. surveyor. Houses (32), Stoke Poges Lane; F. P. Scott & Co., Ltd.

Smethwick.—Houses (29), Hales Lane; Edward Turner, Ltd. Extensions to East works; Birmingham Aluminium Castings, Ltd.

Sunderland.—Development of the Linden estate for J. Wilson, and shops and flats at the corner of Tunstall Road and Queen Alexandra Road; G. E. Matkin, architect, Barclays Bank Chambers, Fawcett Street. Homes, Springwell Farm estate, for the Haig Homes Trust, 6, Duke Street, London, S.W.1. Buildings in connection with the Durham County and Sunderland Eye Hospital; W. & T. R. Milburn, architects, 17, Fawcett Street.

Sutton (SURREY).—Theatre at corner of Grove Road and Bridge Road; Frank Matcham & Co., architects, Oxford Street, London, W.

Tadcaster.—Cinema, Chapel Street, for M. Hartley & Sons, Ltd.; Lomas & Barrett, architects, Colne.

Thornliebank (RENFREWSHIRE).—Houses (331); J. Lawrence (Glasgow), Ltd., builders, Glasgow.

Waddon.—Factory and offices, Commerce Way; Croydon Factory Estates, Ltd. Factory, Mitcham Road; J. B. Rudkin & Co., Ltd.

Ware.—Houses (32), Vineyard estate; Crook Bros., builders, Ware.

Watford.—Houses (24), Radlett; R.D.C. surveyor.

Welshpool.—Cinema for H. Bayliss, Morville Road, Bridgnorth; Webb & Gray, architects, 200, High Street, Dudley.

West Sussex.—Gymnasium and additional cloakroom accommodation, High School for Girls, Worthing, for C.C.; C. G. Stillman, county architect, County Hall, Chichester.

Weymouth.—Houses (24), Dennis estate; James Bros.

Woodside (SURREY).—Houses (33), Harrington Road; R. V. Tutte, West Way, Carshalton.

Yorkshire.—School, Bingley, and extensions to Sowerby Bridge secondary school, including gymnasium, dining hall, &c., for West Riding E.C.